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MARCH, 1939

FACTORY

MANAGEMENT and MAINTENANCE

A McGRAW-HILL PUBLICATION

MAR - 8 1939

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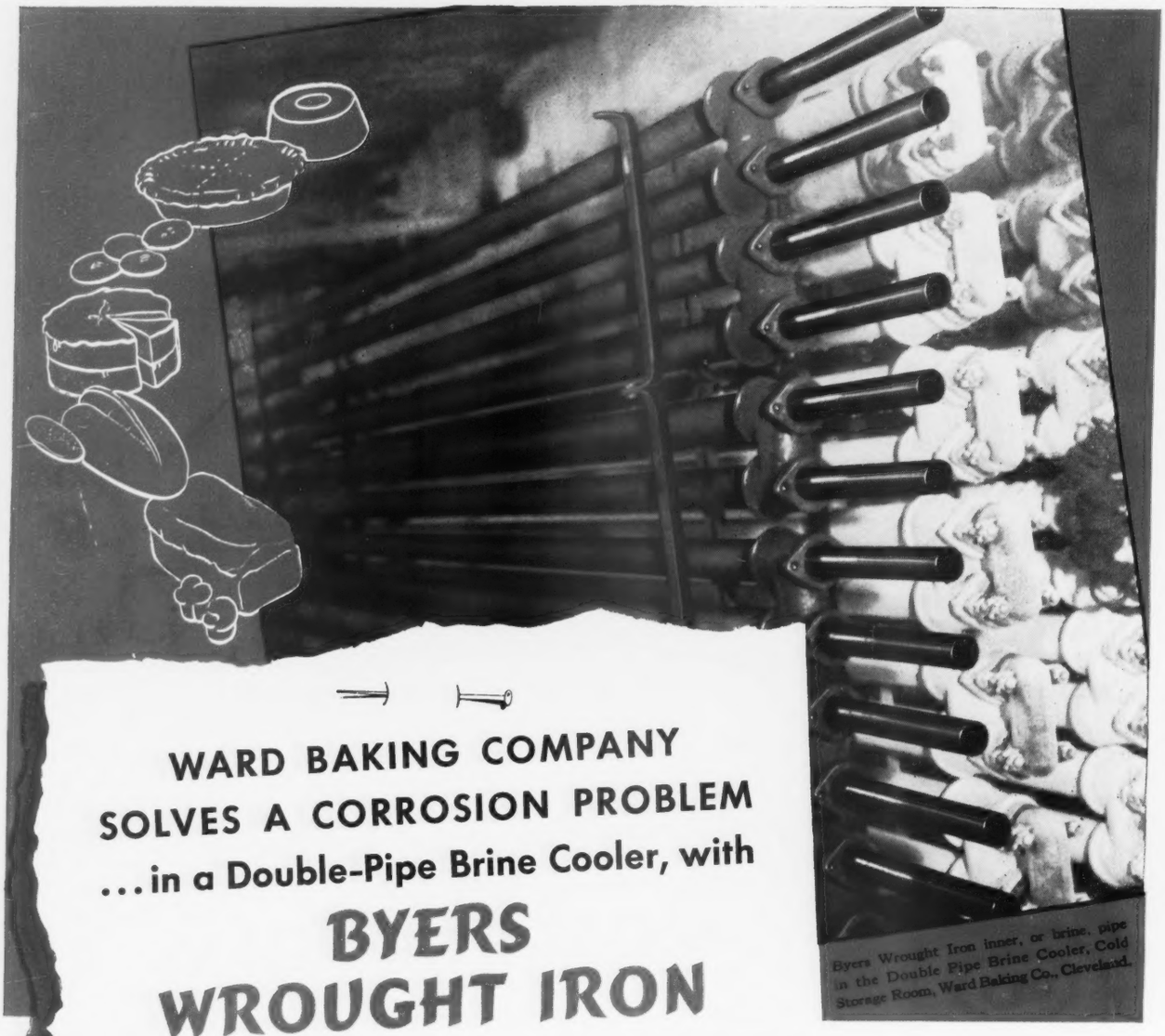
In this Issue: THE WAGNER ACT—WHAT'S CONGRESS WAITING FOR?

CALL THE ROLL OF AMERICAN INDUSTRIES



Byers Wrought Iron inner, or brine, pipe in the Double Pipe Brine Cooler, Cold Storage Room, Ward Baking Co., Cleveland.

WARD BAKING COMPANY SOLVES A CORROSION PROBLEM ...in a Double-Pipe Brine Cooler, with BYERS WROUGHT IRON

One of the largest wholesale bakers in the country, Ward Baking Company, must daily manufacture its complete stock. Even a temporary shut-down is thus extremely serious. Dependability in all equipment is vital.

The Chief Engineer of the Cleveland branch recently discovered that brine was leaking into the suction lines of the ammonia system in the double-pipe cooler. The trouble was traced to one of the coils where, after testing each brine pipe with 70 pounds air pressure, two leaks were revealed.

Since any leak is a danger signal, the entire cooler was carefully inspected. Corrosion had made such inroads that retubing was indicated. With an eye to dependability, Byers Wrought Iron was used.

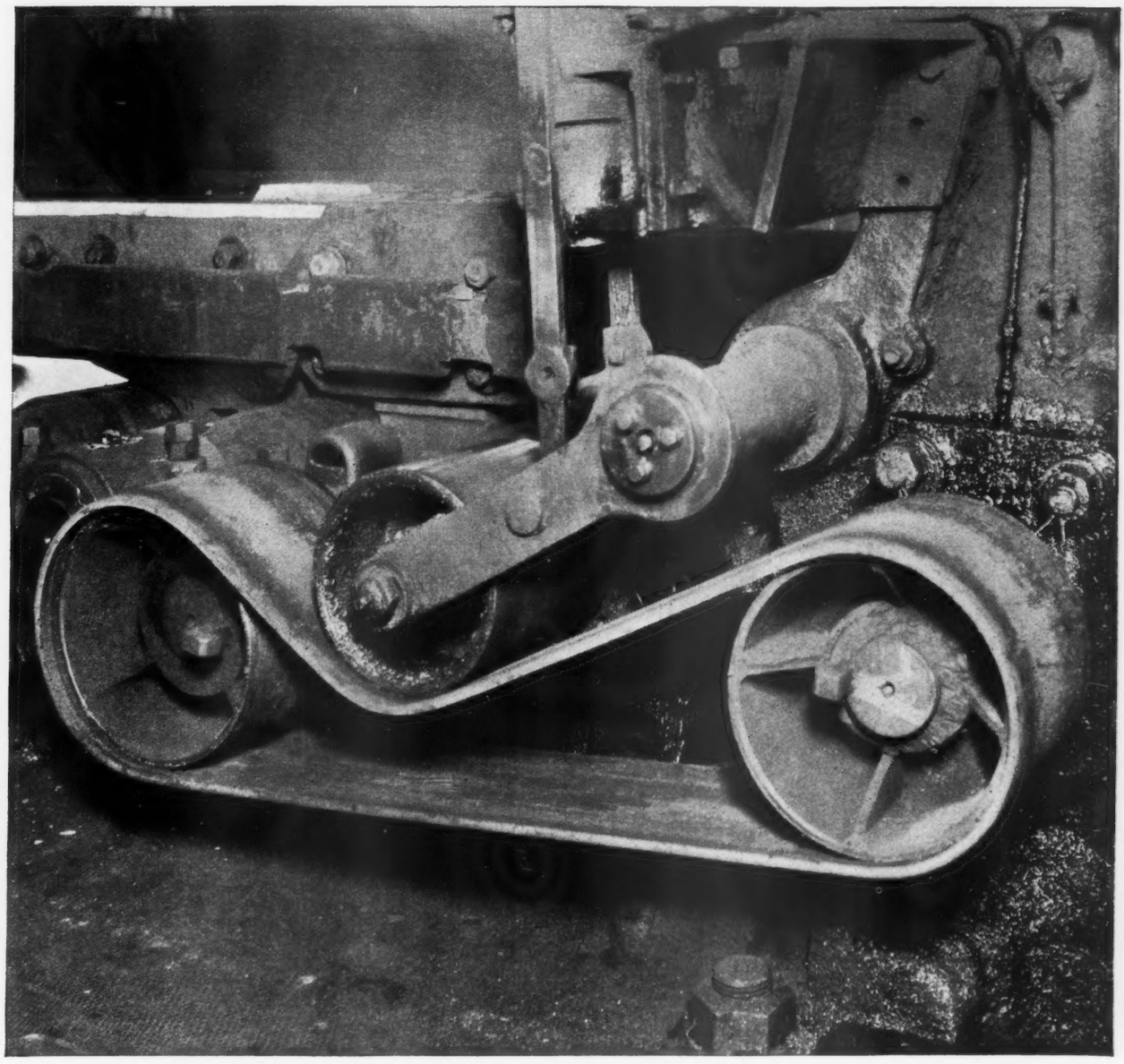
Byers Wrought Iron is particularly adapted for the many corrosive services encountered in refrigeration and air conditioning systems . . . and in every other field of industry as well. If corrosion is causing you trouble and expense, just write, outlining the particular difficulty. Our Engineering Service Department will (1) Determine the exact corrosive conditions involved; (2) Relate these to similar conditions encountered elsewhere; (3) Interpret the results in the light of 75 years' experience with corrosion problems; and (4) Make recommendations . . . supported by service records. If you don't have a copy of the bulletin, "Wrought Iron in Refrigeration and Air Conditioning Systems," just write for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

BYERS GENUINE WROUGHT IRON

TUBULAR AND FLAT ROLLED PRODUCTS

Specify Byers Genuine Wrought Iron Pipe for corrosive services and Byers Steel Pipe for your other requirements



4 GOODRICH BELTS SAVE $783.04

Last 5 times as long as any belt used before; eliminate costly plant delays

WHETHER your drives are easy or hard on belts, this dramatic demonstration may help you cut belting costs, reduce production delays.

Belts were used in a big steel mill to drive huge rolls which rolled red-hot ingots. The ingots stalled the rolls so often that gears couldn't be used—the stalling broke them. Belts had to take the punishment of each stall by slipping. Belt life averaged 3 days.

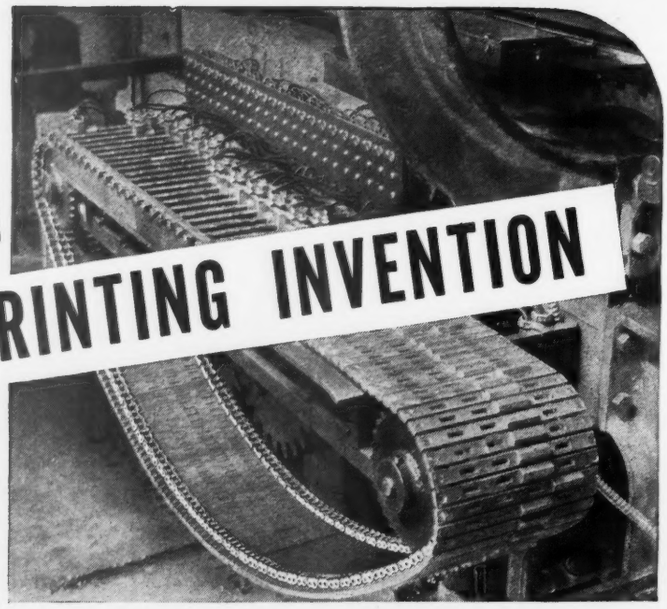
A Goodrich engineer recommended a special Goodrich endless belt, and four were installed. The steel company *hoped* these belts would last 7 days. Weeks later, with the Goodrich belts still operating, the steel company stopped keeping records. The Goodrich belts had already saved $783.04 in belt cost and even more in plant time by eliminating shutdowns.

You may not punish your belts with such a drive, but a belt construction that will stand such severe service will last correspondingly longer on a normal operation. Goodrich Highflex and Multicord belts (both can be made endless on the drive) are establishing new records for long life, low cost, trouble-free operation in thousands of plants. They save you money even at *slightly higher* prices than other belts. Let your Goodrich Distributor show you why. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Goodrich

ALL *products problems* IN RUBBER

What Design Engineers are doing with Silverlink Roller Chain!



NEW RUG PRINTING INVENTION

an interesting application
of Silverlink Roller Chain

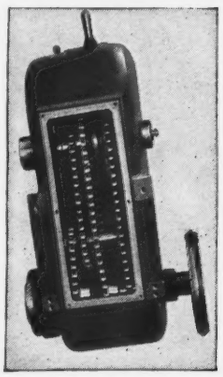
To make rug printing a continuous operation, Dienelt and Eisenhardt, Inc., Philadelphia, developed and patented an Electric Master Control in which they use two matched strands of Silverlink roller conveying chain. A good example of how ingenuity and Silverlink make effective teammates.

THE exceptional performance that is inherent to Silverlink Roller Chain has made it the favorite of leading design engineers and production men, for drives and conveyors. Its smooth, positive action—its rugged durability—its flexibility and good appearance make it the practical chain for countless applications.

Send for Data Book No. 1757—It contains 174 pages of meaty, illuminating information — list prices, ratings and bed-rock figuring and design data.

Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto. Offices and distributors located in principal cities. 7648

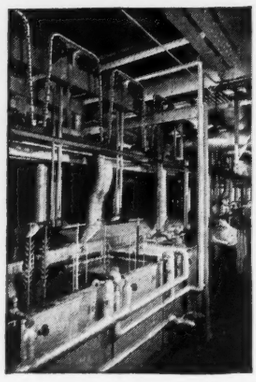
Costs Reduced with Silverlink Roller Chain



Because they developed their honing and reamingmachine with Silverlink Roller Chain as the internal transmission instead of a series of gears, the Automotive Maintenance Machinery Co., North Chicago, Illinois, were able to cut costs and keep their selling price advantageously low.

Automatic Metal Plating!

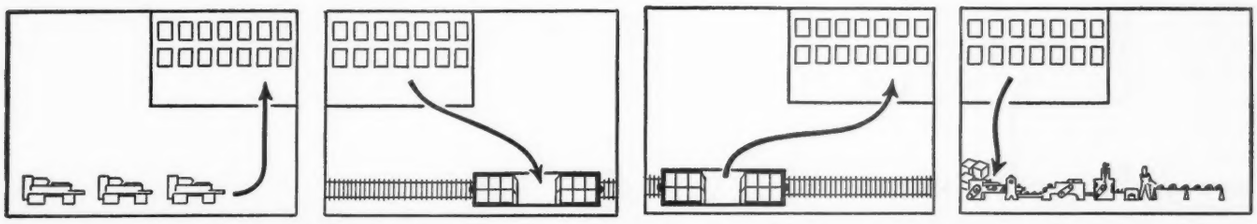
The Meaker Company, Chicago, design and build automatic plating and processing equipment for a wide variety of industries. They are constantly developing new applications of roller chain to meet unusual conditions of service and production. The installation illustrated is in a plumbing fixture plant and shows their Return-type, Full Automatic Metal Plating Unit in which Silverlink Roller Chain is used.



LINK-BELT
Silverlink
ROLLER CHAIN

FACTORY MANAGEMENT and MAINTENANCE (a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering), Mar., 1939, Vol. 97; No. 3. Published monthly. McGraw-Hill Publishing Company, Inc. Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42d Street, New York, N. Y. Entered as second class matter, November, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879. Price 35c a copy. Subscription rates—United States, Canada, Mexico, and Central and South American countries, $3 a year. All other countries, $4 a year or 16 shillings.

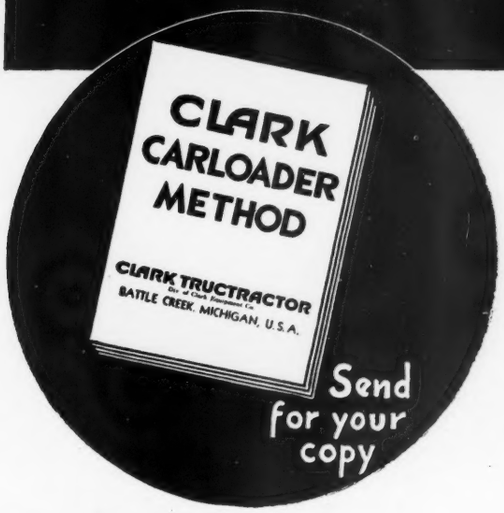
Clark "Carloader" cuts cost at every handling point



Plant of Origin — Production to Storage — Storage to Car

Customer's Plant — Car to Storage — Storage to Production

Here's the new Clark "Carloader". It handles crates, skids, bagged, boxed, baled and strapped loads swiftly, at low cost. Loads and unloads cars in minimum time—increases storage capacity of cars and warehouses.



Costs Must be Lowered!

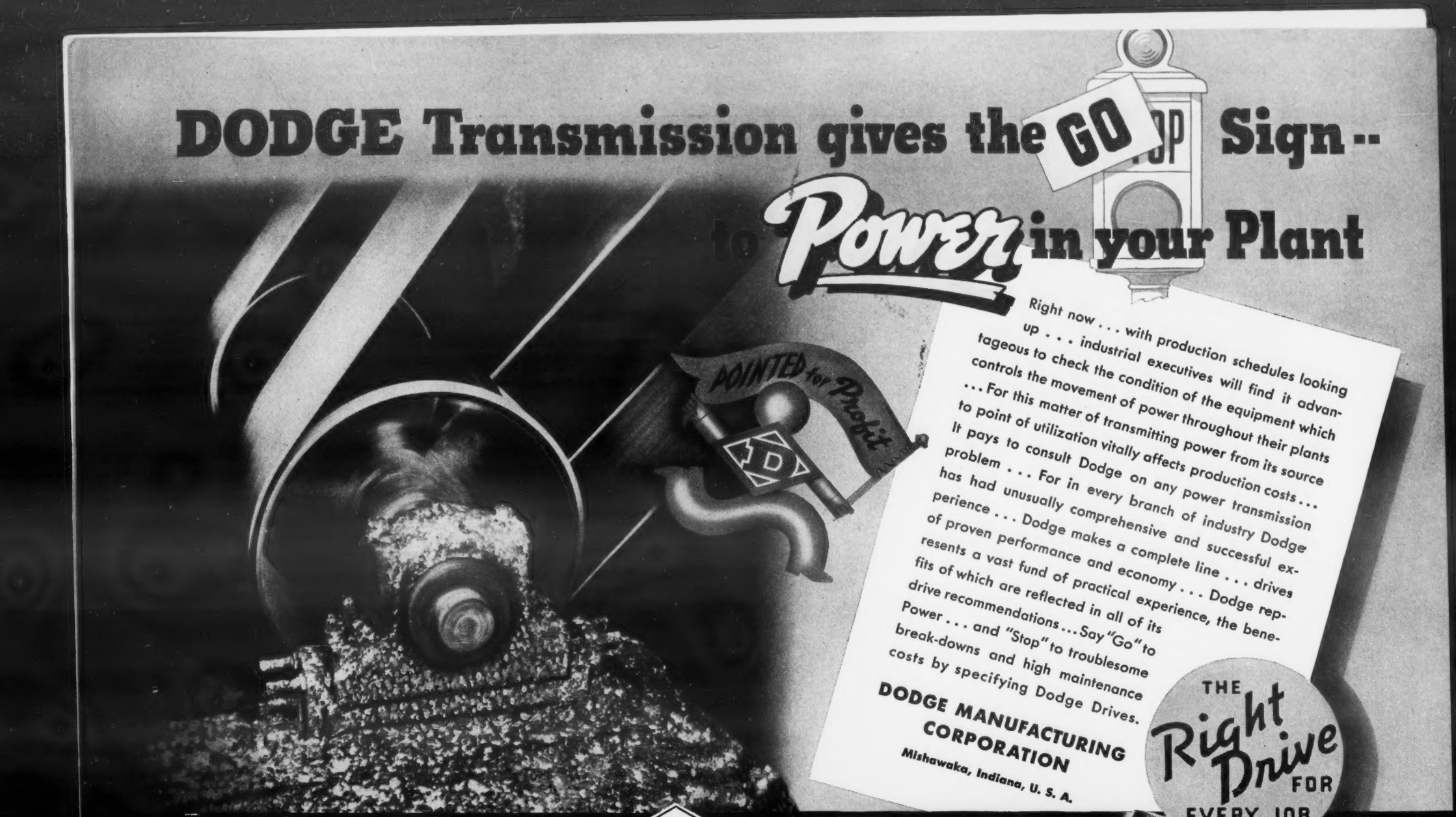
—and the one element of cost left in the control of management is *material handling*. Write today for a copy of the "Clark Carloader Method", describing and illustrating Industry's modern aid to economical material handling.

CLARK TRUCTRACTOR

Div. of Clark Equipment Co.

116 SPRINGFIELD PLACE • BATTLE CREEK, MICH.

DODGE Transmission gives the GO Sign -- to Power in your Plant



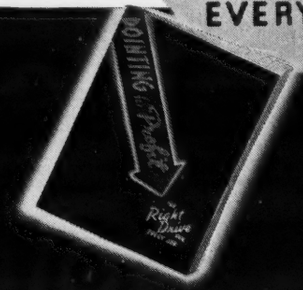
Right now . . . with production schedules looking up . . . industrial executives will find it advantageous to check the condition of the equipment which controls the movement of power throughout their plants . . . For this matter of transmitting power from its source to point of utilization vitally affects production costs . . . It pays to consult Dodge on any power transmission problem . . . For in every branch of industry Dodge has had unusually comprehensive and successful experience . . . Dodge makes a complete line . . . drives of proven performance and economy . . . Dodge represents a vast fund of practical experience, the benefits of which are reflected in all of its drive recommendations . . . Say "Go" to Power . . . and "Stop" to troublesome break-downs and high maintenance costs by specifying Dodge Drives.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U. S. A.

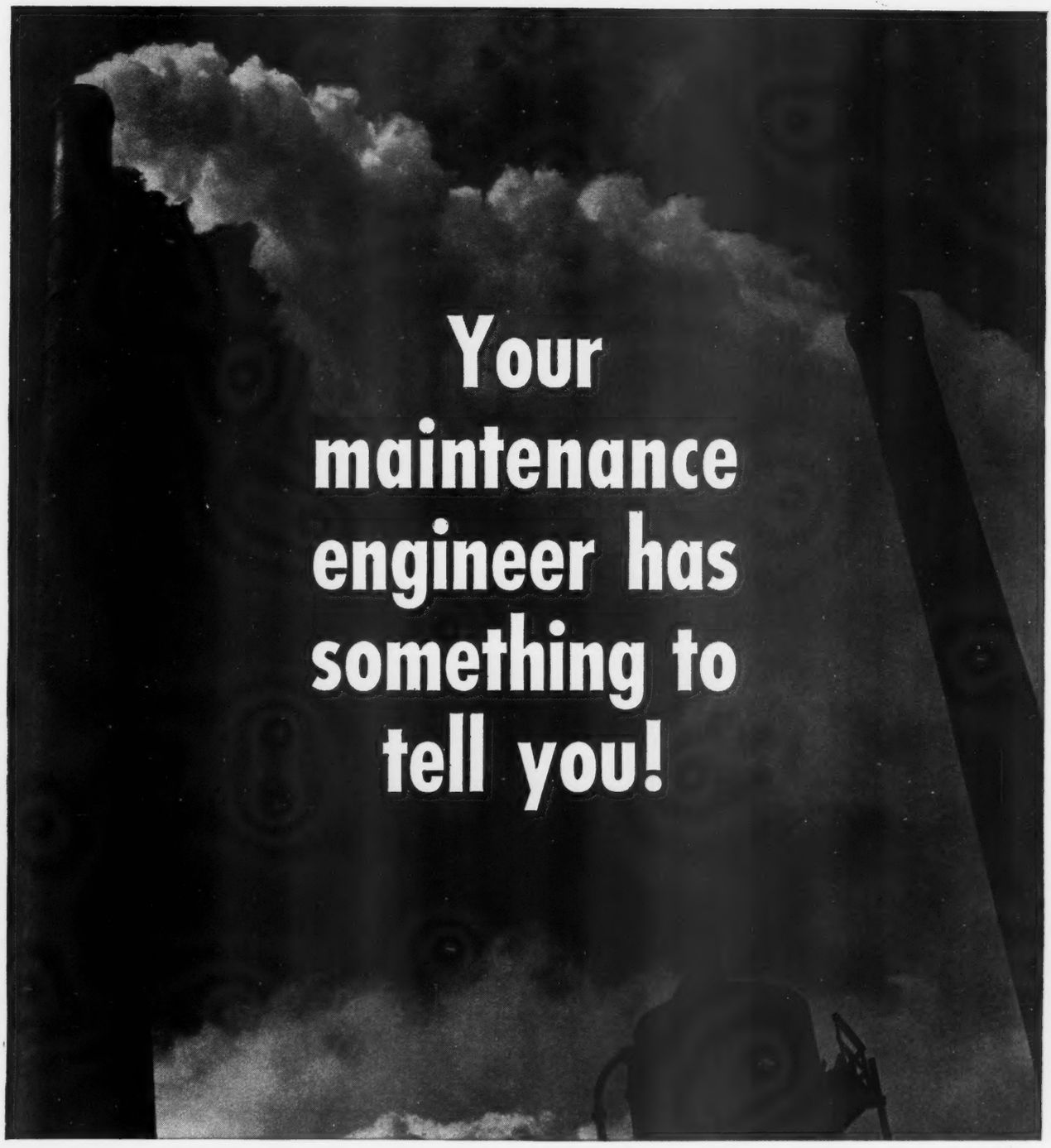
THE Right Drive FOR EVERY JOB

Think of DODGE
MISHAWAKA

. . . when planning a new plant . . . when adding a new department . . . when installing new machinery . . . when modernizing old equipment . . . when designing new products.



Send for this book — "Pointing for Profit" —it will suggest many profitable applications of Dodge Drives.

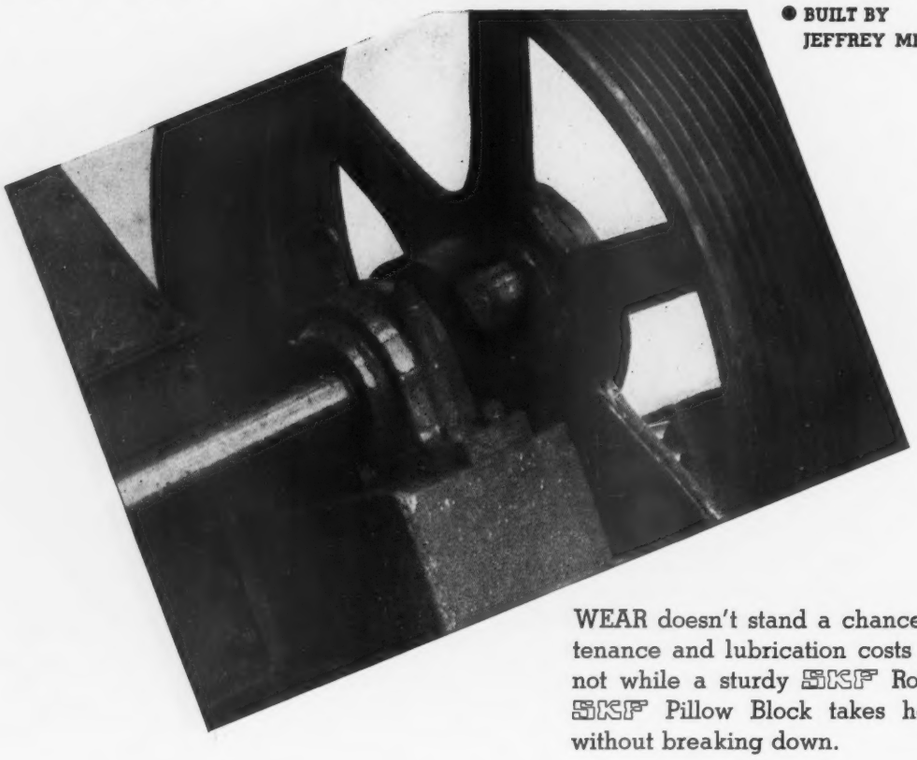


HE'D like to point out what the word "obsolete" is meaning to you in dollars and cents. How a more modern application of power... up-to-date wiring layouts... can bring the greater efficiency that means profits in these days of rising costs. How better lighting and ventilation increase production per man . . . improve workmanship.

We have something to say, too. Modernization ... re-building... need not appear as an over-imposing task. Graybar's 60,000 item Service of Supplies simplifies purchasing... provides a source of everything electrical for every factory need. Graybar specialists can help you with experienced advice on specific lines. And a nearby Graybar warehouse makes these products promptly available... when and where you need them. **OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BUILDING, N. Y.**

IT'S SKF PILLOW BLOCKS ON CRUSHERS

● BUILT BY
JEFFREY MFG. CO.



WEAR doesn't stand a chance of increasing power, maintenance and lubrication costs on this Jeffrey Crusher . . . not while a sturdy SKF Roller Bearing in a dust-proof SKF Pillow Block takes heavy loads year after year without breaking down.

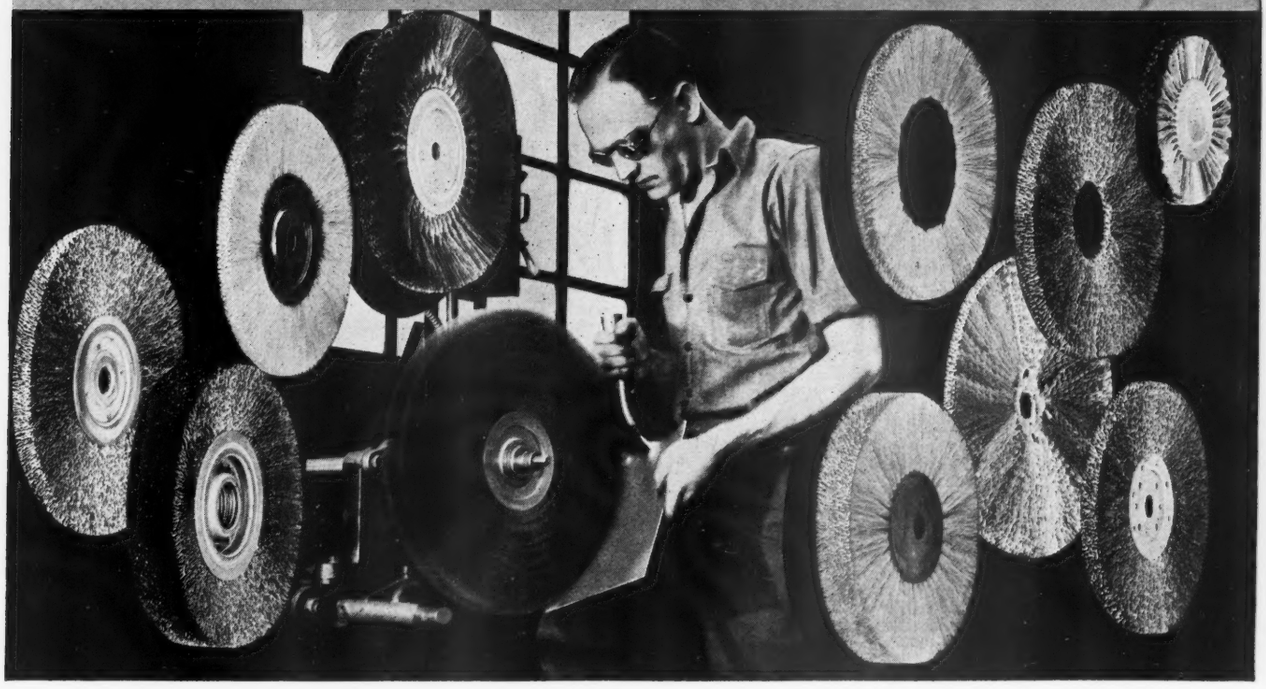
SKF Pillow Blocks are simply constructed, compact units which assure protection to the bearing that's reflected in DEPENDABLE bearing performance. And on shafts up to 30" in diameter, they often pay for themselves within two years. Ask your SKF Distributor how to avoid WEAR on your machines and lineshafts with SKF. 4289

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA.

THE BEARINGS ARE SKF

BALL & ROLLER
BEARINGS

which brush is best FOR THIS JOB?



• A standard type of Osborn Brush was selected for the job illustrated. From among the many types of standard Osborn Brushes was one that was right for the job, cost less and gave better results.

• Standard Osborn Brushes meet a multitude of needs. Osborn and the Osborn Distributor near you can help select the right brush for each job. *Ask about it!*

OSBORN

IT'S GOOD BUSINESS TO USE GOOD BRUSHES

Specify Osborn Brushes

AND USE THE RIGHT BRUSH FOR THE JOB

THE OSBORN MANUFACTURING COMPANY • 5401 HAMILTON AVENUE · CLEVELAND, OHIO

BE SURE of YOUR "I C"

THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits, and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They gravely endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices.

Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

If you have any question about how to determine the interrupting capacity needed, in order to know the size of circuit breaker to use, get in touch with the nearest G-E office.

"I C" = Interrupting capacity

GENERAL

If you check your "IC"

Interrupting capacity

You'll Want to Install Air Circuit Breakers at Once on Main and Branch Feeders

THEY not only have plenty of "I C" —they provide overcurrent protection, with adjustable time delay, and you can restore service at once—by simply turning the handle.

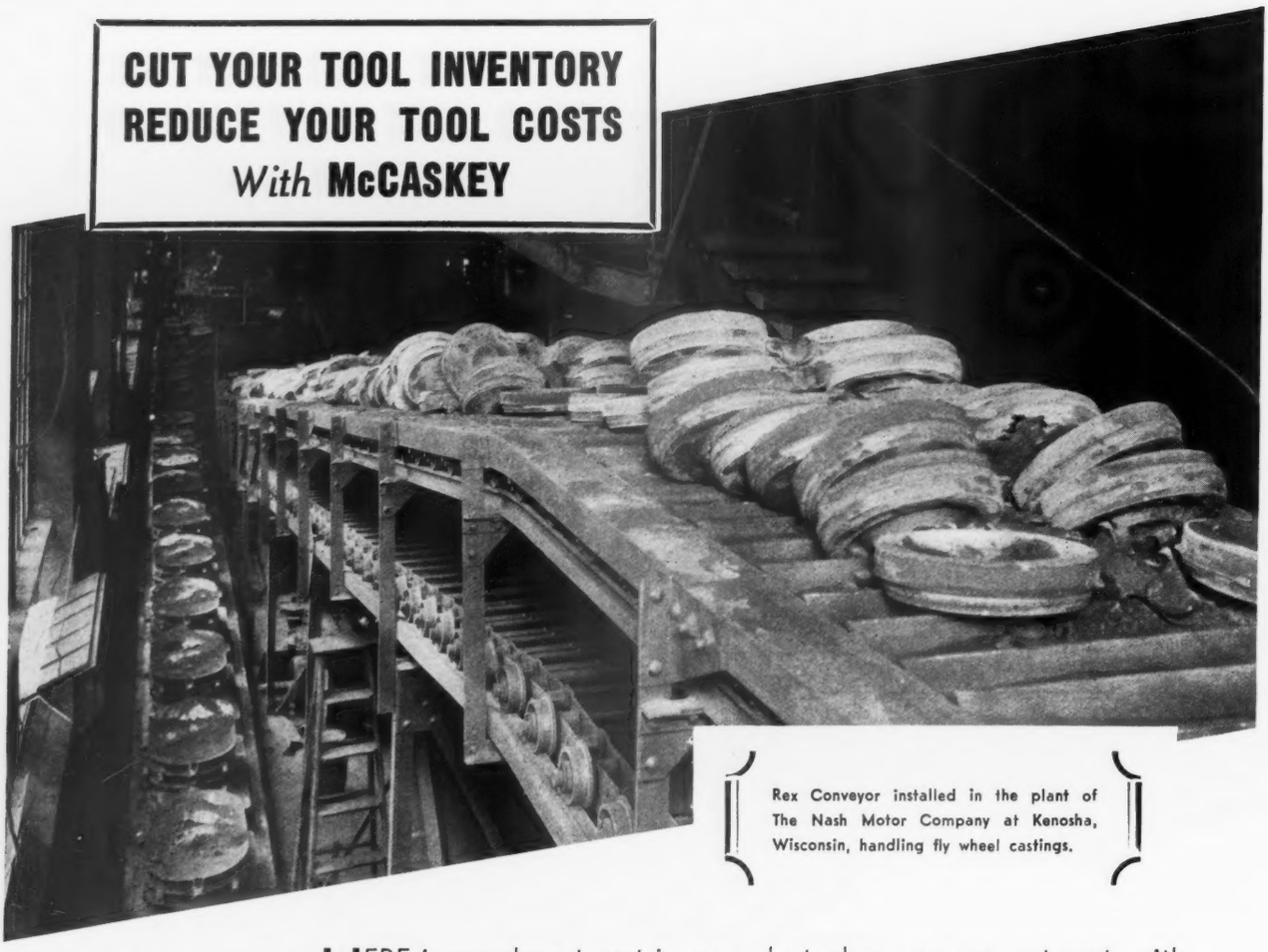
For main feeders—the metal-enclosed, shipped-assembled switchboard with draw-out-type breakers

For branch feeders—the individual safety-enclosed breaker with plenty of "I C." Designs available for interrupting currents up to 50,000 amp

ELECTRIC

890-78

CUT YOUR TOOL INVENTORY
REDUCE YOUR TOOL COSTS
With McCASKEY



Rex Conveyor installed in the plant of The Nash Motor Company at Kenosha, Wisconsin, handling fly wheel castings.

HERE is one department in your plant where you can cut costs without a big initial investment. Most cost-cutting plans require a fat budget, if they result in worth while savings. But not this one..

And, with it you can cut down your tool inventory, eliminate lost tools, reduce breakage and speed-up service with substantial savings that will continue year after year.

Read the experience of The Chain Belt Company, Milwaukee, Wis., manufacturer of conveyors and transmission equipment, concrete mixers, contractors pumps and other construction equipment, summarized by L. H. Bosnian, Superintendent

"McCaskey Tool Control gives us a complete control of the tools stored in our cribs. Tools are promptly returned when an operation is completed. Lost tools have been eliminated. The tool inventory has been reduced and breakage lowered.

"The operation of the control is so simple and speedy that the crib attendants and workmen like it better than the brass check method that it superseded."

● Let us send you the pamphlets, "A Modern Tool Control System in A Modern Plant" and "No Lost Tools Any More", providing more detailed data on the results achieved with McCaskey Tool Control in two representative plants. Or, without obligation, let us have a representative analyze your specific needs. Write today.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

"That's Great! - but what do you do with regular orders?"

- ALLOYS
- ANGLES, HOT ROLLED and COLD ROLLED
- ARCHES (CORRUGATED)
- BABBITT
- BANDS and HOOPS
- BARS, HOT ROLLED
  - ALLOYS (HR and CF)
  - COLD FINISHED
  - ELECTRIC HIGH CARBON STEEL
  - REINFORCING
- BEAMS and C. B. SECTIONS
- BEEF RAIL
- BOLTS, NUTS, WASHERS, ALL KINDS
- BORING and TURNING BARS and GRINDERS
- BRACES, BOILER
- CHAIN, ALL KINDS
- CHANNELS
- CHISELS
- CHUCKS, STAYBOLT
- CLAMPS, BOILERMAKERS
- CLIPS, PATTERSON
- CLEANERS, FLUE
- CONDUCTOR PIPE
- COPPER and BRASS
- COUPLINGS, HOSE
- CRAYONS, SOAPSTONE
- CUTTERS
- DARDELET RIVET and MACHINE BOLTS
- DRILL RODS
- EAVE TROUGH and FITTINGS
- EXPANDERS, FLUE
- FERRULES, COPPER
- FLANGES, BOILER and TANK
- FLOOR PLATES
- GALVANIZED SHEETS, BARS, BANDS, ETC.
- HANDLES, HAMMER
- HEADS, TANK and FLANGE
- HOISTS, HAND and POWER
- IRON, STAYBOLT
- LUGS, BOILER, TANK and SILO
- MACHINERY, HAND and POWER
- MANHEAD PLATES and FITTINGS
- NAILS
- PACKING
- PAINT STICKS
- PLATE STEEL, STANDARD QUALITIES
  - ABRASION RESISTING
  - COR-TEN and MAN-TEN
- PLUGS, FLUE
- RAILS and FITTINGS
- REAMERS
- SHAFTING
- SHEETS
  - ABRASION RESISTING
  - COR-TEN and MAN-TEN
  - HOT ROLLED and UNIFORM BLUE
  - WELLSVILLE POLISHED
  - COLD ROLLED
  - STAINLESS STEEL
  - GALVANIZED and GALVANNEALED
  - LONG TERNE
  - CORRUGATED
  - U-S-S COPPER STEEL
- SPRING STEEL BARS and SHEETS
- STAINLESS STEEL
- STRIP STEEL, CR and HR
- TEES
- TIRE, ROUND EDGE
- TOOLS, HAND and POWER for BOILER and IRON WORK
- TROLLEYS
- TUBES, BOILER
- TURNBUCKLES
- VALVES, BLOW-OFF
- WELDING ROD and WELDERS
- ZEES

USS Scully Service

"A salesman from the Scully Twin Cities Warehouse was calling on a customer when his shop foreman came in and wanted 25 angles within an hour. The Purchasing Agent was peeved. But our salesman said we could make delivery. A phone call resulted in delivery of the material in 25 minutes—in fact before our salesman had left."

"OF course," said the Purchasing Agent, "you naturally wanted to impress me. But, what kind of delivery do you make on regular orders?"

Our representative was glad this question was asked. For each of the eight Scully Warehouses operates on the principle that customers always want their materials prepared and shipped at once. Promptness is the rule on all orders big or little. And when there's an unusual emergency Scully knows that unusual service is needed, so we act accordingly.

That's why thousands of customers all over the country depend upon Scully Service when they want steel, steel products, copper or brass.

Phone, write, or wire the warehouse nearest you. See for yourself why friendly Scully Service has made and held so many friends. And ask for our handy complete Stock List and Reference Book—it's free.

SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel, Steel Products, Copper and Brass

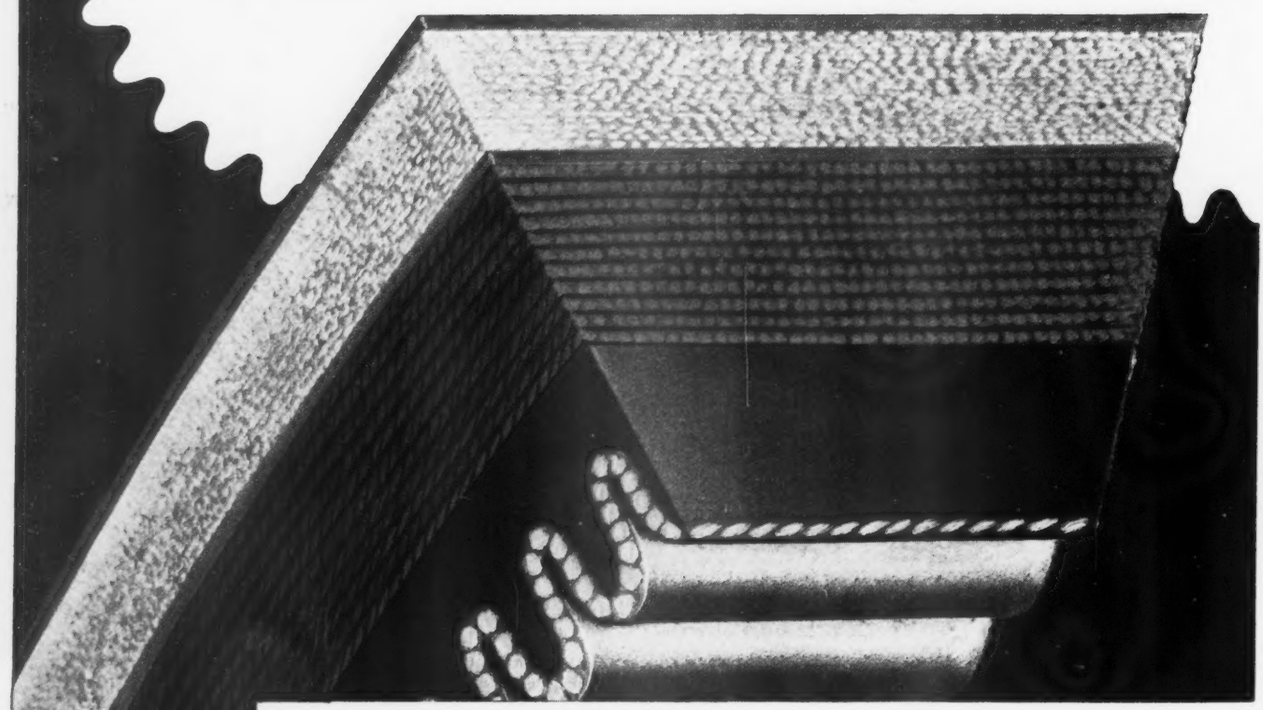
CHICAGO · NEWARK, N. J. · ST. LOUIS · BOSTON · ST. PAUL—MINNEAPOLIS
CLEVELAND · PITTSBURGH · BALTIMORE

UNITED STATES STEEL

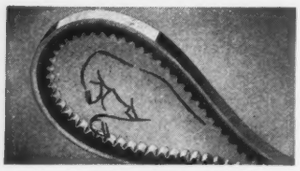
From the Research

THE WORLD'S LARGEST MAKER

IMPROVED Super-Flex



Outstanding in Basic Scientific Design—the Improved Super-Flex Dayton Cog-Belt with Daytex Cord Gives You These EXCLUSIVE Advantages of Cooler Running, Longer Life

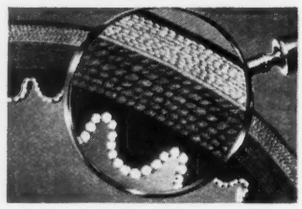


Built to Bend

In Dayton's convolute layer construction the entire belt is built to bend—less internal strain—longer life. And because of the cross-wise regidity, Dayton Cog-Belts ride true in the pulley grooves. No twisting—no distortion—cooler running, longer life.

Patented Cog Construction

Dayton's patented cogs close up when the belt goes around the pulley—and take up the compression on the inside of the belt. Another reason why Super-Flex Dayton Cog-Belts are more flexible—cooler running and longer lasting.



Greater Gripping Power

Because of their die-cut sides Dayton Cog-Belts have greater gripping power—the highest coefficient of friction of any belt.

Laboratories of

OF V-BELTS COMES THIS

DAYTON COG-BELT WITH DAYTEX CORD

In millions of applications, Dayton Cog-Belts have established remarkable records for long life—for the delivery of smooth, silent, constant driving power at low cost. Now, Dayton, the pioneer in the latexing of cord for V-Belts, brings you another revolutionary development—the improved Super-Flex Cog-Belt made with Daytex Cord.

Cooler Running

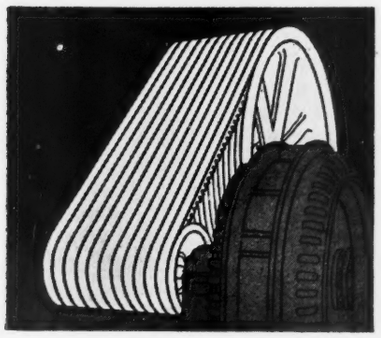
Cooler running because it defeats life destroying internal heat, this improved Super-Flex Dayton Cog-Belt with Daytex Cord is the result of 7 tireless years of tests and research by Dayton's famed technical laboratories. This long-lived Daytex Cord—with inter-locked non-slip fibres—latex processed by exclusive patented Dayton equipment—sets an entirely new standard of strength and compactness—it's a cord with minimum stretch—a cord with super-flexibility.

Longer Life—Fewer Adjustments

Today, this compact, Super-Flex, stronger Daytex Cord in the neutral section of Dayton V-Belts sets a new standard of long-lived power transmission. The improved Super-Flex Dayton Cog-Belts last longer than ever before. Maintenance costs are still lower because fewer adjustments are necessary! No slip—no stretch. These Super-Flex Daytons deliver positive, dependable, shock-proof power.

Learn first-hand what this improved Super-Flex Dayton V-Belt can mean to you in increased production with lower cost. Write for the facts today.

THE DAYTON RUBBER MFG. CO.
DAYTON, OHIO



Whether for fractional or a thousand horsepower—there is a Dayton V-Belt Drive for the job.

Super-Flex

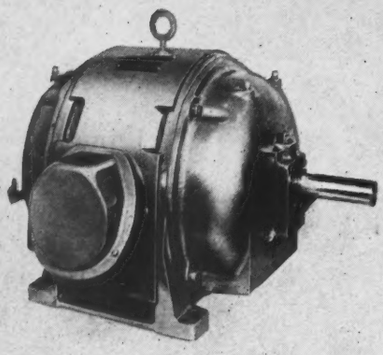
Dayton

COG-BELT DRIVES

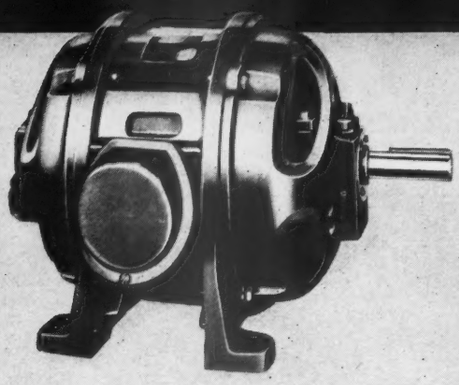
WITH DAYTEX CORD

MADE BY THE WORLD'S LARGEST D MANUFACTURER OF V-BELTS

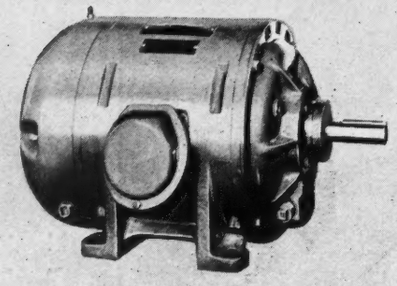
TO DO THE JOB THE ONE BEST WAY



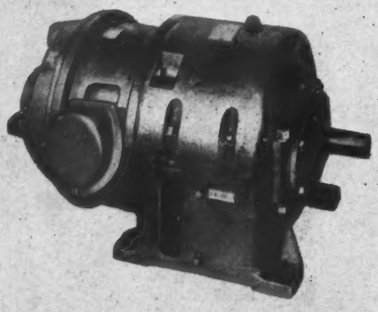
Splashproof enclosure



Westinghouse General Purpose Motor—the workhorse of industry

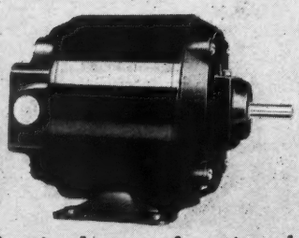


Totally enclosed, fan cooled enclosure



Westinghouse gearmotor for slow speed machines

Modernizing with the right motor and control justifies itself in savings



Westinghouse fractional horsepower motor

Combination Linestarter

Saves

lost production time due to fuse replacements... combines magnetic starter and fuseless circuit protection.

Westinghouse Safety Switch Diamond Pointed Break Jaw and extended blade

Saves

dressing down, saves maintenance expense.

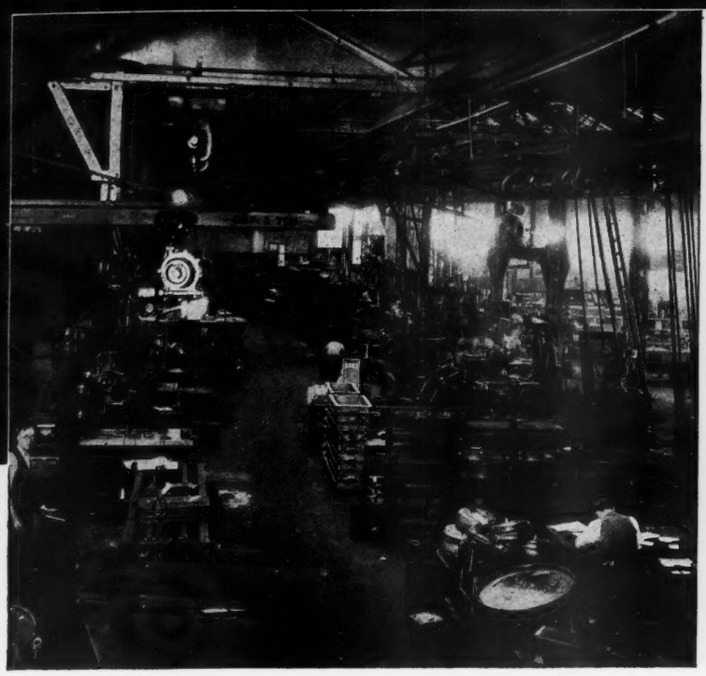
Westinghouse Motor Watchman... Manual Starter for Smaller Motors...

Saves

in First Cost... Saves in Operation.

Westinghouse

W WESTINGHOUSE ELECTRIC



Maintenance Costs in this Machine Shop Cut 75%

As part of a complete plant modernizing job, an eastern glassware company took stock of its motor and control performance. They found that motor maintenance alone was costing over $2400.00 a year.

Motors placed near the molding machines were the greatest source of expense, due to the fact that windings were exposed to hot oil fumes. Bearings on motors near batch mixers seldom lasted more than a year.

Westinghouse modern fan-cooled motors, totally enclosed, solved both problems, cutting maintenance expense 75%.

Make sure that you are not overlooking opportunities to save money in your production line with modernized equipment. Let a Westinghouse representative show you how improvements in complete electric drives justify their installation in dollars saved.

J-90151

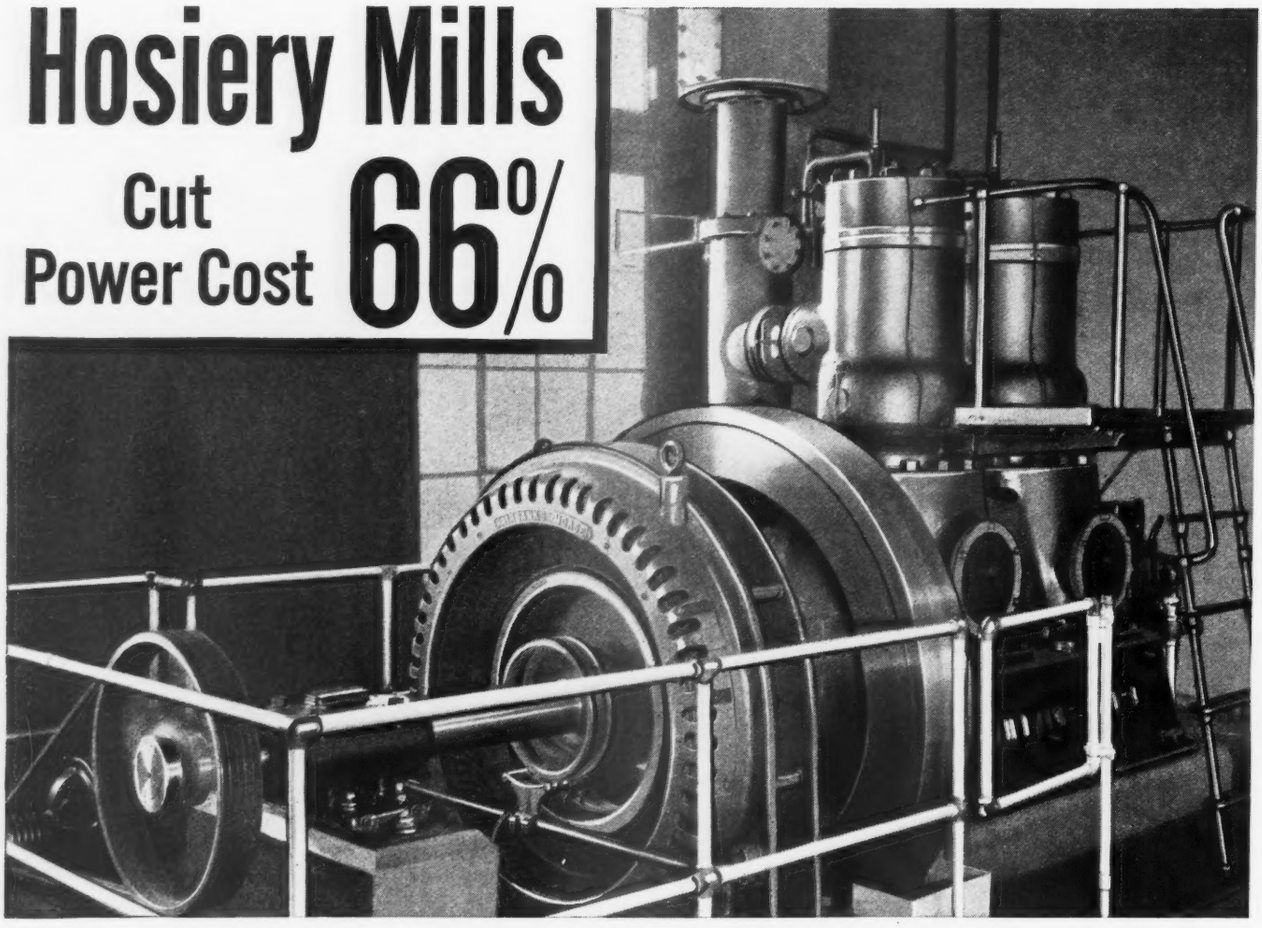
WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

There is a Westinghouse electrical wholesaler, industrial agent, or district office in all principal cities

Motors and Control

F-M DIESEL CASE HISTORIES

Hosiery Mills Cut Power Cost 66%



Installation of Fairbanks-Morse Diesel Generating Unit Saves $2650 a Year

Officials of the Blue Line Hosiery Mills, Denver, Pa. believed their power cost was too high. So they investigated the cost of generating their own power with Diesels. After careful comparison, they installed a Fairbanks-Morse Diesel engine direct-connected to a Fairbanks-Morse generator.

Down went power costs . . . 66 per cent.

The Fairbanks-Morse Diesel in this plant furnishes power for operating 22 full-fashioned knitting machines, a well pump, stoker, unit heaters, humidifying equipment, air compressors, and electricity for lighting.

A power cost reduction of 66 per cent is something for any type of business to think about, but such savings are not unusual with F-M Diesel engines. Investigate!—name the date—and we will supply the facts. Fairbanks, Morse & Co., Department 30, 600 S. Michigan Avenue, Chicago, Ill. 36 branches and service stations throughout the United States.

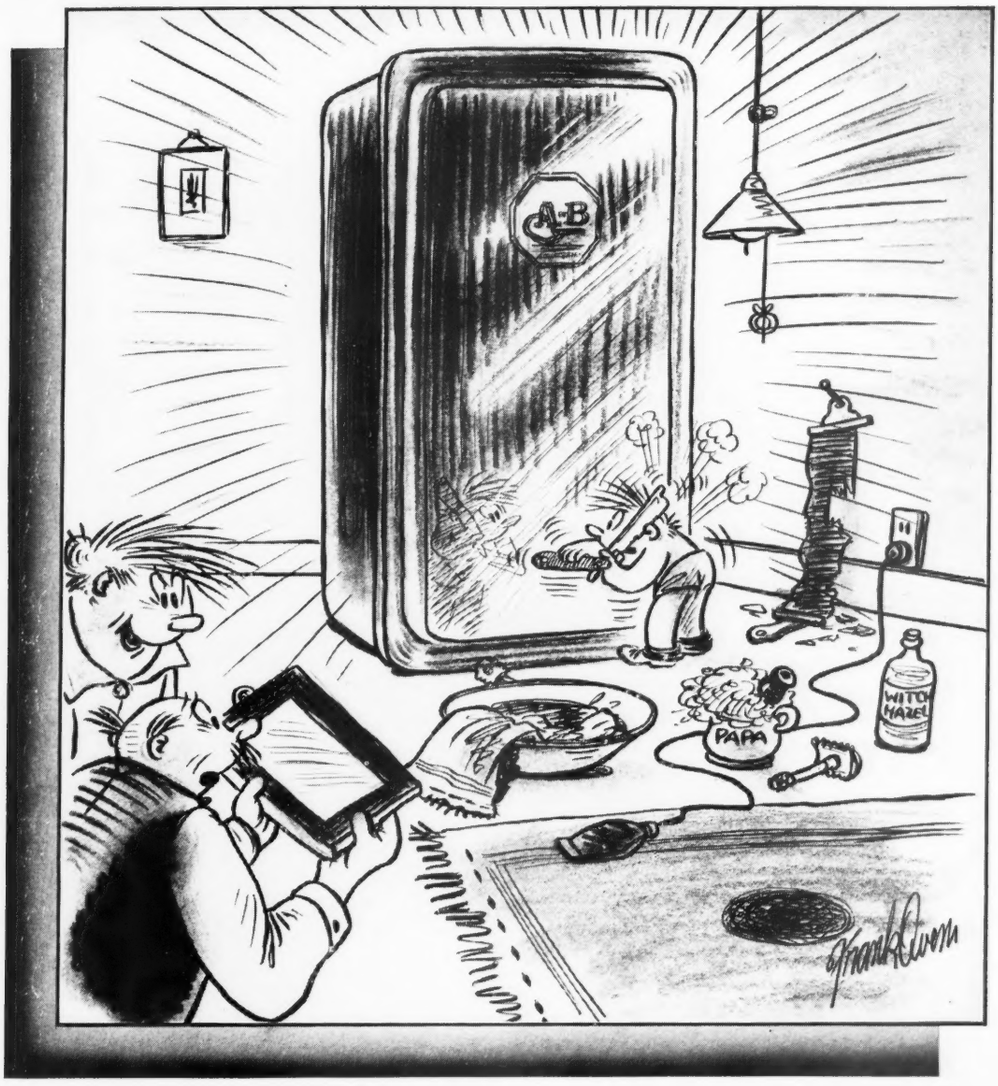
7501-OA40.150

FAIRBANKS MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT

WATER SYSTEMS
WASHERS-IRONERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

Diesels



"Don't worry about his ear. He says that cabinet is shinier than your shaving mirror!"

Maybe you won't care to use the Allen-Bradley solenoid starter's glossy black cabinet as a shaving mirror, but you will like its attractive appearance. And this good looking cabinet encloses a simple and rugged solenoid starting switch which will give you millions of trouble-free operations.

You never have to clean or file the double break, cadmium silver alloy contacts on this starter. Thus, valuable contact metal is not wasted and contact life is prolonged. Also it is easy to install the Allen-Bradley solenoid starter. It has generous wiring space, white interiors, accessible terminals, and many knockouts. Here is a starter designed for your toughest jobs. It will pay you to specify Allen-Bradley control.

Bulletin 709 across-the-line starters for squirrel cage motors. Maximum rating: 30 hp, 220 v; 50 hp, 440-550 v.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

"TROUBLE?
-Not with Allen-Bradley Control"

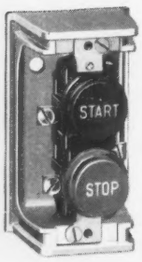
"I always thought motor starters were the 'weak links' on our machines. But since we installed those Allen-Bradley solenoid starters, I've changed my ideas a lot. These starters are in almost continuous operation, yet they never give us any trouble. Believe me, when we need more starters, I'm going to be sure they're Allen-Bradley!"

A NEW Push-Button Station

New in Styling

Note the clean, modern appearance of this new Bulletin 800 push-button station. With its glossy black, heavy bakelite cover and sturdy die cast frame, it is the ideal "start-stop" station for any general purpose application.

New in Ideas



The silver-to-silver contacts are located where dust and dirt must do tricks to get at them. Yet the terminals could not be more accessible. Removing the cover completely exposes the push-button unit, making the wiring of the button a "cinch." Ask your Allen-Bradley representative to show you this new A-B push-button station.

THE MOTOR STARTER THAT'S *TROUBLE-FREE*

Simple Construction

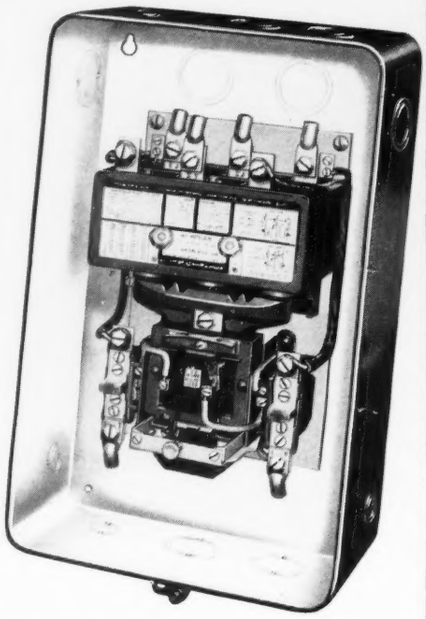
No bearings, no pivots, no complicated mechanisms—that's the secret of the Allen-Bradley solenoid starter's long and trouble-free performance.

No Contact Maintenance

You never have to file the double break, cadmium silver alloy contacts. That's one reason why they last many times as long as ordinary contacts.

No Unnecessary Shutdowns

Because of the efficient solenoid action and straight-line motion, welded contacts and shutdowns caused by poor line voltage conditions are avoided.



Bulletin 709, Size 2, across-the-line solenoid starter for squirrel cage induction motors.

Rugged Parts

This simple starter has few parts. They are extremely rugged and will withstand abuse.

Overload Protection

Two eutectic solder overload relays protect the motor from sustained overloads. They are reset by pressing a small button on the cabinet front.

Send for "The Story of the Solenoid Starter"

Allen-Bradley Company
1321 S. First Street
Milwaukee, Wisconsin

Please send me a copy of "The Story of the Solenoid Starter."

Name ----------

Company ----------

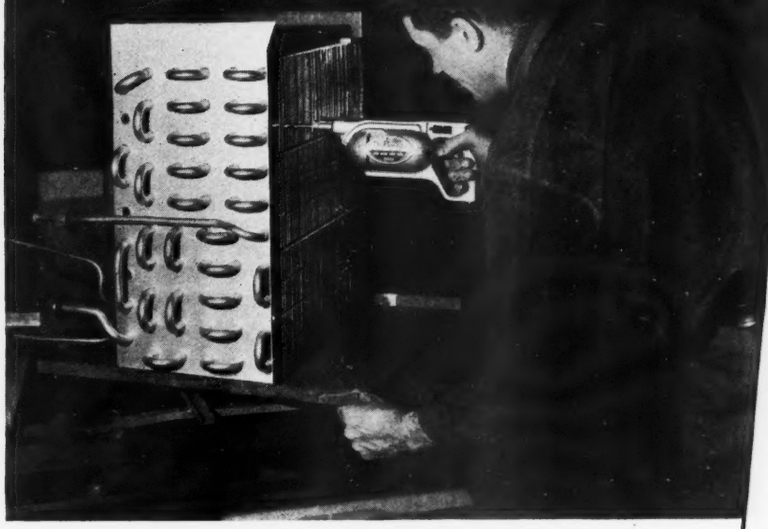
Street ----------

City ---------- State ----------

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

the new tool to buy for light-duty ¼" drilling!

Thor Drillmaster



THE QUALITY DRILL IN THE LOW-PRICE FIELD

$19.95

Capacity .....¼"
Free Speed...2000 R.P.M.
Weight .....4 lbs.
Length Overall .....12"

Universal motor, 110 or 220 volts. Jacobs chuck, recessed thumb-control switch, 3-conductor cable and plug.

POWER . . . PERFORMANCE

AT ONE LOW PRICE!

Today's biggest news about tools is this low price for Thor's new light-duty, ¼" electric drill. The Drillmaster is the first drill to bring fine-tool quality within the reach of every tool user. It has typical Thor features of design and construction formerly found only on high-priced tools — PLUS the most efficient motor ever put in a tool in this price class! A trial will convince you that the Drillmaster is the best $19.95 worth of drill you could find . . . that dollars and sense say "Buy it!" Use the coupon below to get more information or to get a Drillmaster on 10 days FREE TRIAL.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. JACKSON BLVD., CHICAGO, ILL.

Thor offers more!

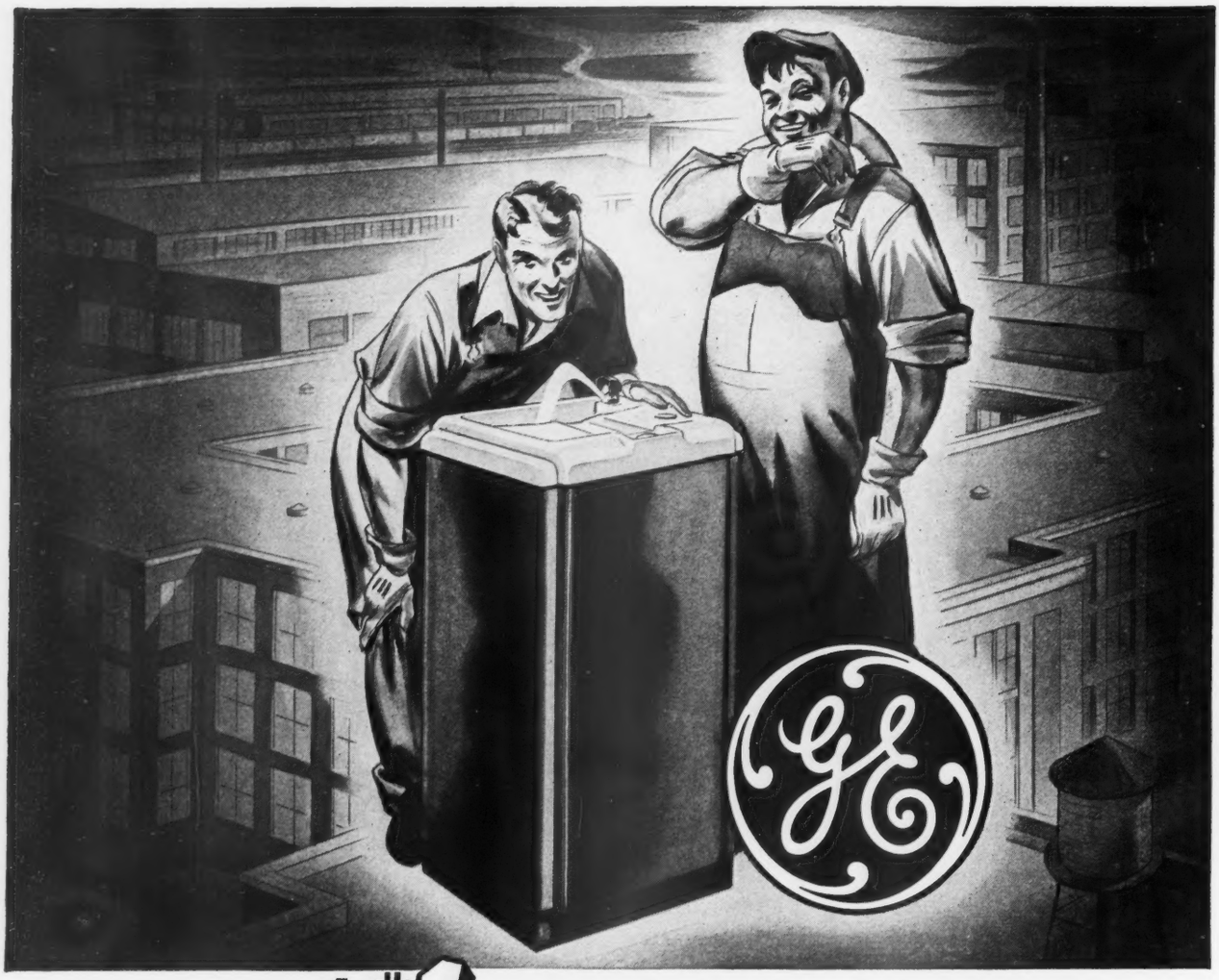
IN

PORTABLE ELECTRIC TOOLS

INDEPENDENT PNEUMATIC TOOL CO.
600 W. JACKSON BLVD., CHICAGO, ILL.

☐ Send information on ¼" Drillmaster
☐ Send ¼" Drillmaster on 10 day FREE TRIAL
(Indicate voltage desired ☐ 110 volts ☐ 220 volts.)

NAME .....
FIRM NAME .....
ADDRESS .....
CITY .....STATE .....



INDUSTRY'S #1 DRINKING FOUNTAIN!

MODELS FOR EVERY NEED

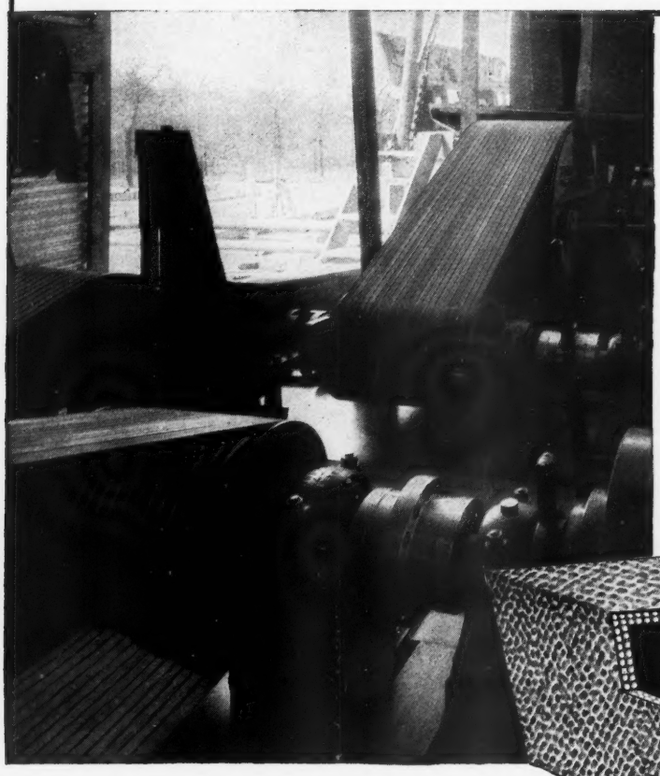
● Nearly 2,000,000 people now enjoy cool, healthful, refreshing drinking water from General Electric Water Coolers every day! There's a reason for their great popularity in American industry . . .

G-E Water Coolers deliver the thrifty service you *must have* to make your investment profitable. They are famous for dependable, low-cost operation and long life. The new Stainless Steel Water Reservoir that ends rust, leaks and corrosion is just one of many General Electric advanced features that contribute to *enduring* economy.

The big, new General Electric Water Cooler Catalog shows the complete G-E line of models and all their new features. Ask your G-E Dealer for a free copy or write today to General Electric Co., Commercial Refrigeration Section CT3, Nela Park, Cleveland, Ohio.

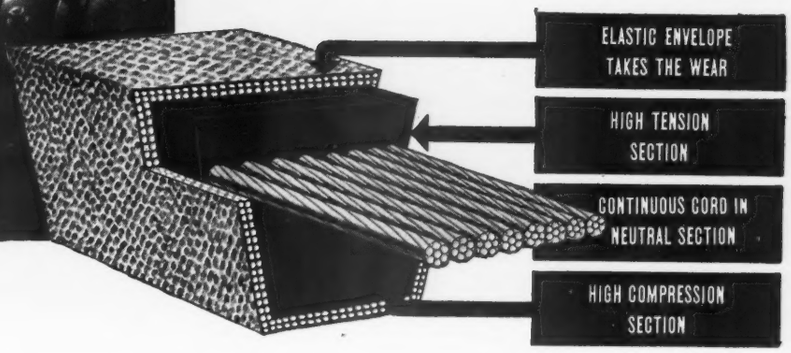
GENERAL ELECTRIC *Water Coolers*

Maximum Power Transmission..AT NO EXTRA COST



New MEDART V-BELTS

"They Grip the Grooves"



Transmit the maximum power at a minimum cost—by using the NEW Medart V-Belts which combine every feature of the most modern drive design.

They give you the maximum in V-belt service because of their "balanced groove gripping" action . . . Accuracy of cross section assures a balanced groove grip . . . The load carrying section of the belt is co-ordinated with its groove gripping action . . . Each strand in each individual belt and each belt in a multiple belt drive carries its proportionate share of the load.

Medart Sheaves — furnished in all sizes.

Write Direct — or get in touch with the nearest Medart Representative or Distributor.

Engineering Service
Medart Engineers will co-operate with you in the selection of the V-belt drive that will give you continuous service for the least expenditure.

THE MEDART COMPANY
3512 DeKalb St. • • • St. Louis, Mo.

MEDART

YOU CAN RELY O

Rely on Gar

When one of your plant men says, "We'd better use Gargoyle D.T.E. Oil here"— you can be sure he's a man of good, sound judgment.

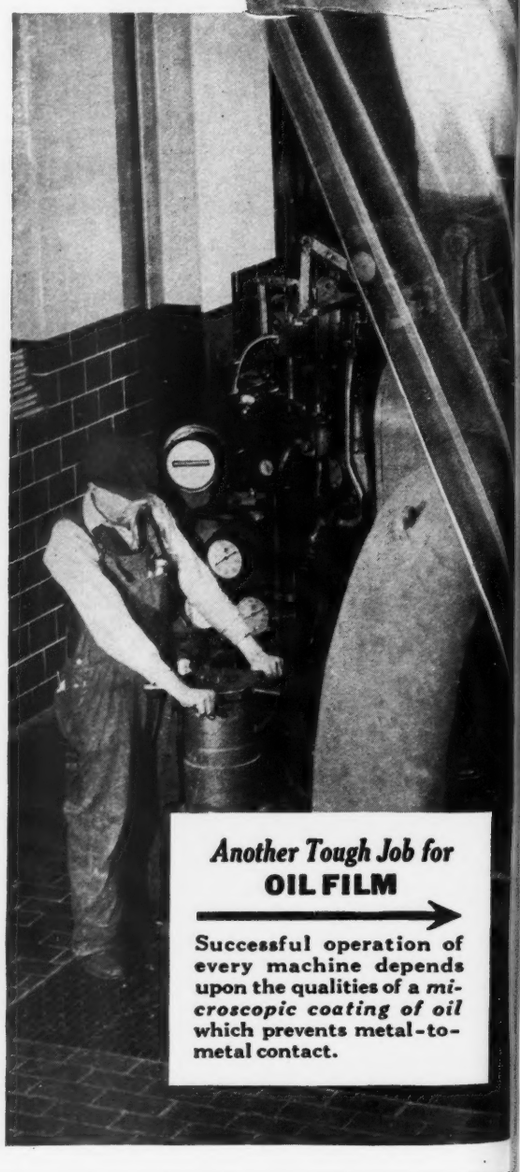
These oils provide oil film of high purity ...unusual chemical and physical stability. They separate fast from water. Since the first days of the turbine, they've proved a source of reliable operation... low lubrication cost per operating-hour.

THE SOCONY-VACUUM man offers you a complete line of lubricants, plus these *exclusives:*

The right lubricant for every machine...and new lubricants ahead of new needs...developed by world-famous research laboratories through close cooperation with machine builders.

73 years' experience—thousands of case histories—to guide in prescribing the right use of these lubricants to gain Lubrication Profits for you.

World-wide distribution and guaranteed uniformity—the same quality available everywhere.

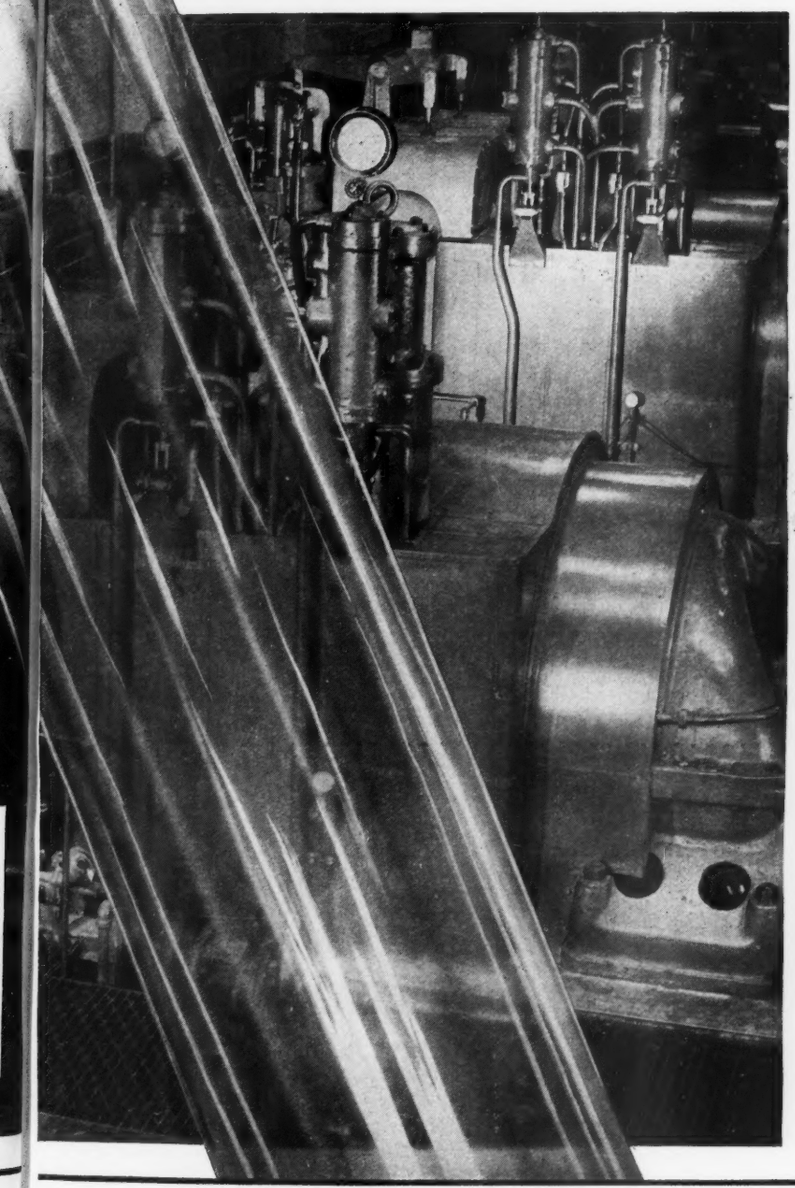


Another Tough Job for
OIL FILM

Successful operation of every machine depends upon the qualities of a *microscopic coating of oil* which prevents metal-to-metal contact.

Y ON MEN WHO

goyle D.T.E.'s



SOCONY-VACUUM

Industrial Service and Lubricants Help to Lower Costs by

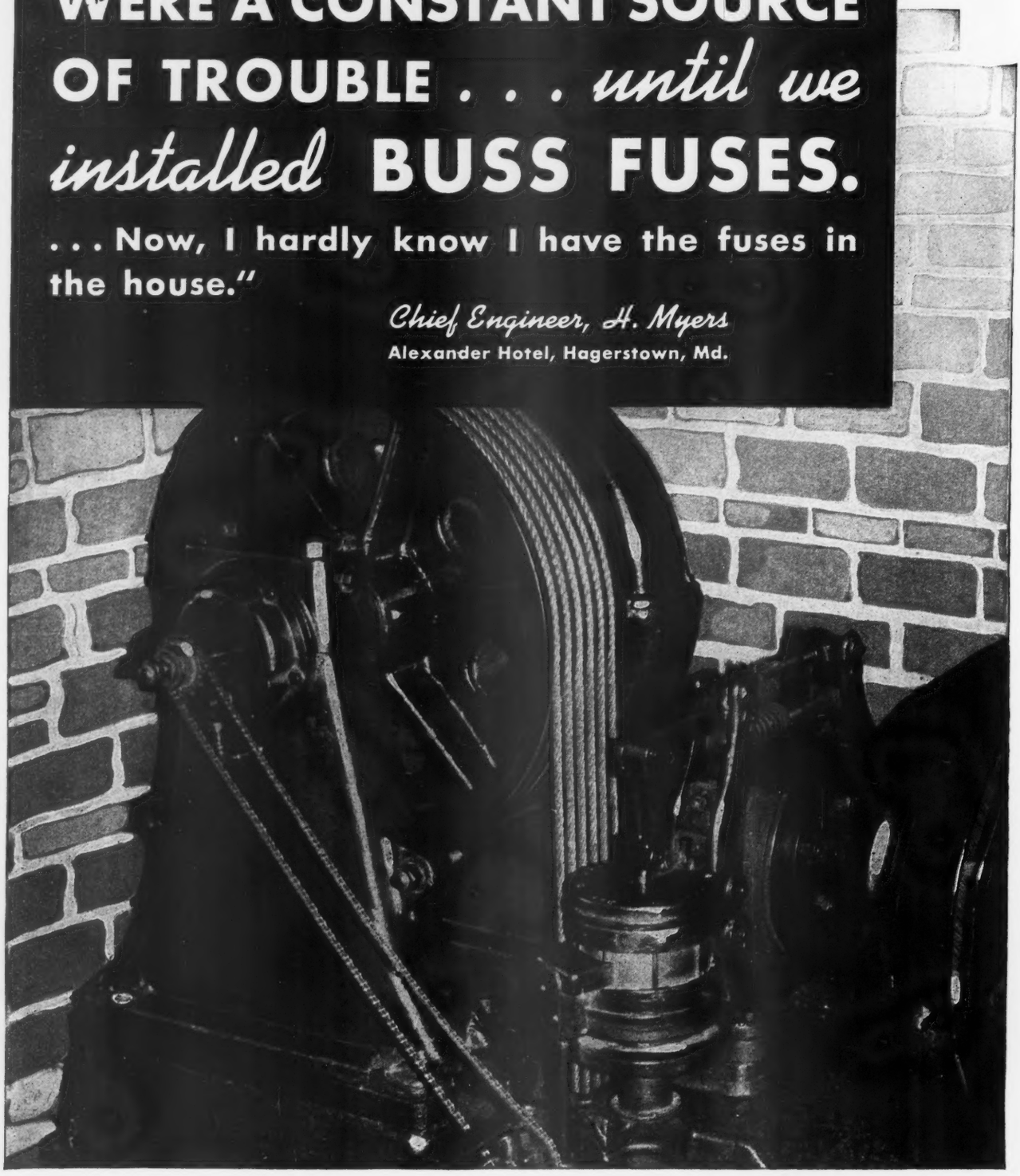
Correct Lubrication

GARGOYLE Lubricants

"OUR ELEVATOR CIRCUITS WERE A CONSTANT SOURCE OF TROUBLE . . . *until we installed* BUSS FUSES.

. . . Now, I hardly know I have the fuses in the house."

Chief Engineer, H. Myers
Alexander Hotel, Hagerstown, Md.



BUSS

HERE'S THE STORY,

as related by Mr. Myers

"THE 200 ampere fuses protecting our elevator circuits were a constant source of trouble blowing on an average of 10 times a month.

"About 5 years ago I installed BUSS SUPER-LAG Fuses of the same amperage. Since then I don't recall having as many as one blow per year —in fact I hardly know I have fuses in the house."

Why Should Any Plant Suffer Needless Blows **that can be prevented?**

Like all good fuses BUSS Super-Lag fuses protect plant and equipment against electrical hazards—and they DO MORE—as stated by Chief Engineer Myers, they protect against unnecessary and senseless shutdowns.

Naturally there are sound reasons for this kind of performance.

The design of the BUSS FUSE-CASE is such that it reduces to a minimum any chance for poor contact to develop in the fuse itself.

Hence heating from poor contact —that so often causes needless blows — is practically wiped out.

The Super-Lag development in the FUSE-LINK gives BUSS FUSES a retarded blowing point—or long time-lag that permits them to hold on without blowing when harmless overloads are piled on circuits already loaded.

Thus when motors start under load—or machines jam momentarily—or any of the hundreds of things occur that cause temporary, harmless over-currents, BUSS Super-Lag Fuses keep right on holding and the plant keeps right on running and nobody even thinks about the BUSS fuses that are holding down the job of protecting against electrical hazards.

The book "How to Select Renewable Fuses" tells the story. A free copy is yours for the asking.

•

BUSSMANN MFG. CO.
University at Jefferson
ST. LOUIS
Division McGraw Electric Company

WHY BUSS FUSES
DON'T BLOW NEEDLESSLY
10 FEATURES in the design of the FUSE-CASE help make it possible..
The SUPER-LAG development in the FUSE-LINK completes the job.

Super-Lag FUSES

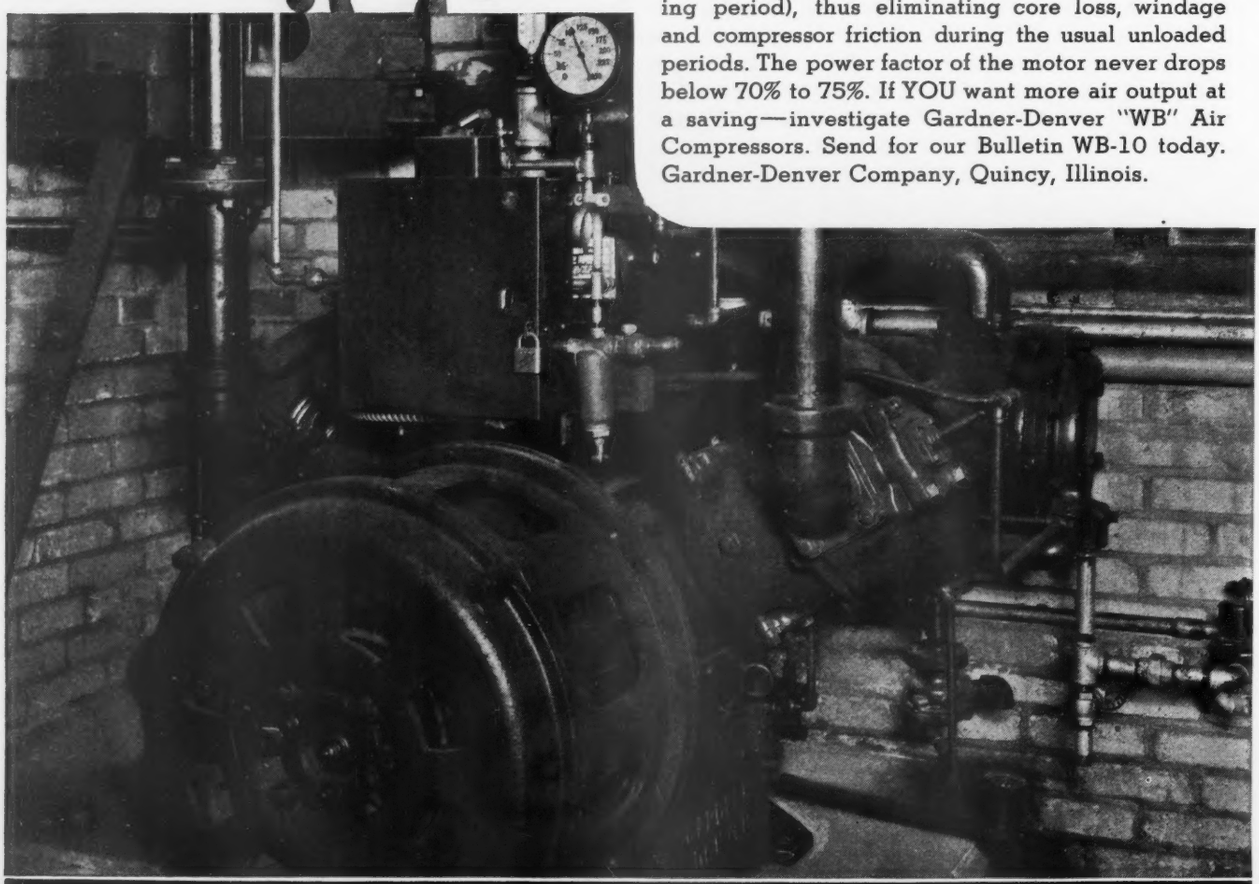
BUSS 1914 Silver Anniversary 1939 25 years progress in fuses

ELECTRICAL BILLS DOWN 10%

when they put in this Gardner-Denver Compressor

—YOUR Power Costs Will Melt with Gardner-Denver Compressors . . .

● A large manufacturing plant has reduced its electrical bills 10% per month by changing to a Gardner-Denver "WBE" Compressor equipped with Duo-matic Control. Yet the Gardner-Denver Compressor provides much more air than the previous current-wasting compressor! Because of Duo-matic Control—which regulates the running of the compressor in accordance with air needs—the Gardner-Denver Compressor consumes 20% less current per cubic foot of air delivered than the former machine! Equipped with Duo-matic Control, the compressor runs at constant speed with suction valve unloading, when the air requirements of the plant are heavy. When the air demand is light, the compressor switches over to automatic start and stop—thus always operating in the most efficient manner regardless of the load—and without requiring the attention of an operator, because the control is entirely automatic. The motor never runs unloaded (except for a few seconds during the starting period), thus eliminating core loss, windage and compressor friction during the usual unloaded periods. The power factor of the motor never drops below 70% to 75%. If YOU want more air output at a saving—investigate Gardner-Denver "WB" Air Compressors. Send for our Bulletin WB-10 today. Gardner-Denver Company, Quincy, Illinois.



GARDNER-DENVER 80th ANNIVERSARY YEAR

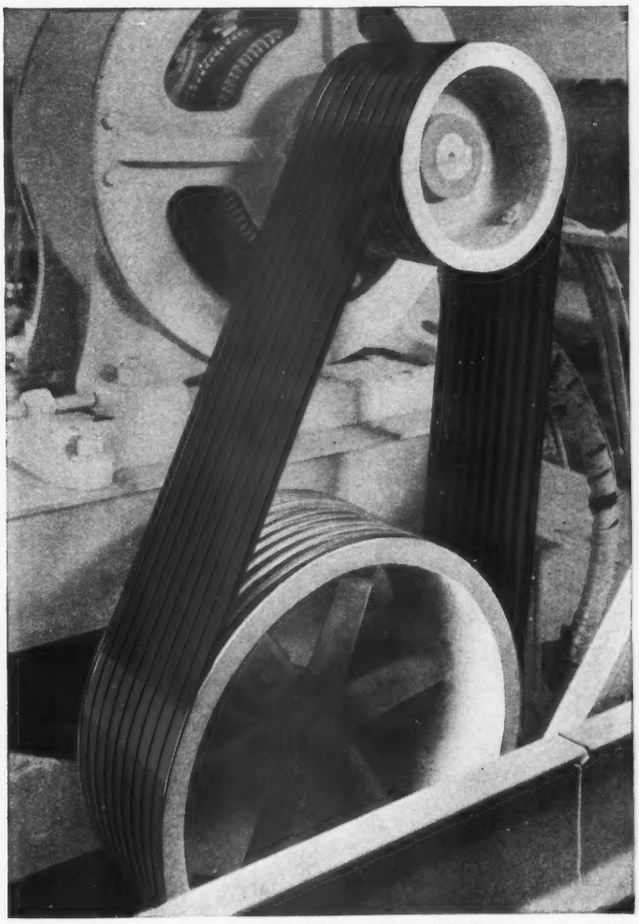
By Their Savings You Will Know . .

Condor WHIPCORD V-BELTS

Once you've equipped your drives with Condor Whipcord V-Belts, you begin to realize a saving . . . a saving that steadily grows as production, operating and maintenance costs go down.

Condor Whipcord V-Belts are designed and built to save you money. As a result of Manhattan's original construction, which places strong endless whipcords in the neutral axis area, Condor Whipcord V-Belts are practically unaffected by destructive internal heat and side wear that cause slip and premature breakdown. They maintain their firmness, uniform length and flexibility to keep the toughest drive operating efficiently, economically for days on end.

Once you've equipped your drives with Condor Whipcord V-Belts, you'll watch production step up . . . costs step down. Write for Bulletin 6868. It explains what Condor's 8-Point Balanced Construction* means in V-Belt performance.



One of a group of Condor Whipcord V-Belt installations in a large cement mill

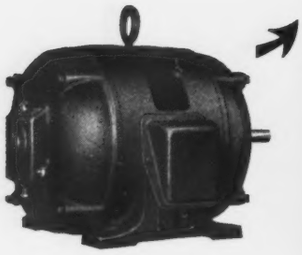
Condor PRODUCTS

- Conveyor and Elevator Belt
- Transmission Belt
- V-Belt
- Air Hose
- Contractors Hose
- Fire Hose
- Hydraulic Hose
- Oil and Gasoline Hose
- Sand Blast Hose
- Steam Hose
- Suction Hose
- Water Hose
- Chute Lining
- Launder Lining
- Industrial Brake Blocks and Lining
- Molded Rubber Goods
- Rubber Lined Tanks
- Rubber Covered Rolls
- Abrasive Wheels

*8-POINT BALANCED CONSTRUCTION

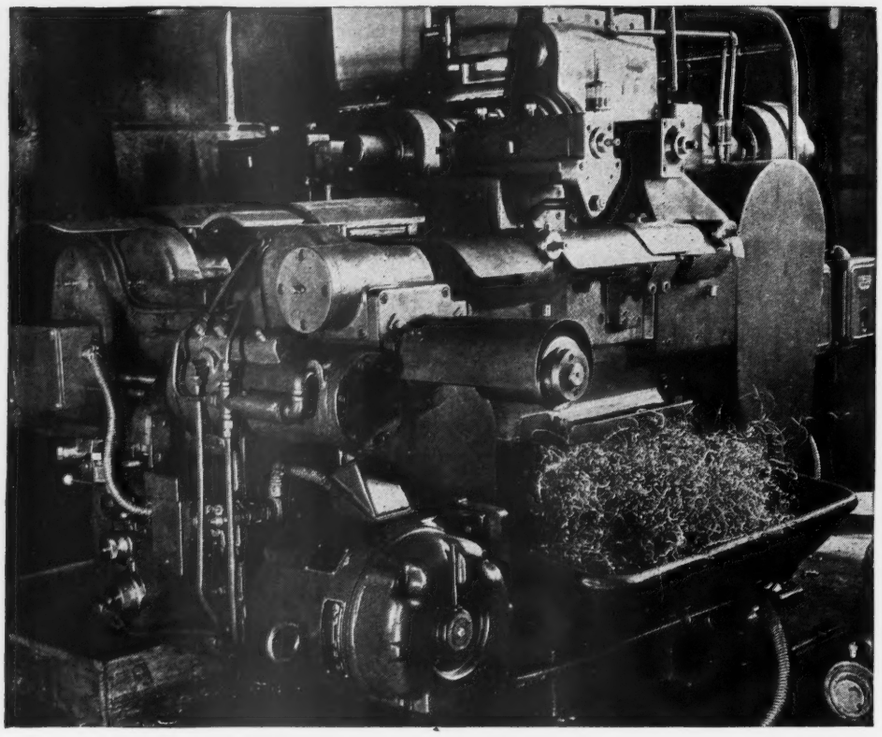
1. Minimum Ultimate Stretch.
2. Wide Margin of Effective Strength.
3. Uniform Flexibility.
4. Maximum Resistance to Structural Breakdown.
5. Smooth Running.
6. Maximum Traction.
7. High Resistance to Side Wear.
8. Correct Lateral Reenforcement.

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES AND FACTORIES
46 Townsend St., Passaic, N. J.



ABOVE
THE WORK LEVEL
OPEN TYPE MOTOR

BELOW
THE WORK LEVEL →
SPLASH PROOF MOTOR



• • *Century Motors* Economically Meet Service and Location Requirements

More and more, "wise money" in industry is buying motors on the basis of meeting specific application requirements than on a unit cost per horse power. As a result thousands of users of Century Motors consider them as a good capital investment—because their economies can be so tangibly figured when service and location requirements are properly met. For instance—in the Machine Tool Field:

Above the Work Level . . . Here the construction of a Century Standard Open Type Squirrel Cage Motor is satisfactory in the majority of the metal working plants because of their unusual insulation resistance and their ability to keep themselves clean inside through positive ventilation passages.

Below the Work Level . . . Here it is wiser to use Century Splash Proof Motors. The heavy enclosed frame and end brackets protect the vital parts of the motor when it is in the path of falling chips, splashing cutting oils, or heavy particles dropping from the work level.

For proof in your plant of Century service and performance, see your nearest Century Motor Specialist—listed at the left.

Call a Century
MOTOR SPECIALIST

Atlanta • Baltimore • Boston • Buffalo
Chicago • Charlotte • Cincinnati
Cleveland • Dallas • Denver
Davenport • Detroit • Indianapolis
Kalamazoo • Houston • Kansas City
Los Angeles • Milwaukee • New York • Minneapolis • New Orleans
Omaha • Philadelphia • Pittsburgh
Rochester • Salt Lake City • Tulsa
San Francisco • Spokane • Seattle

●

Century MOTORS

CENTURY ELECTRIC COMPANY
1806 Pine Street • • • St. Louis, Mo.
Offices and Stock Points in Principal Cities

ONE OF THE LARGEST EXCLUSIVE MOTOR MANUFACTURERS IN THE WORLD

BULL DOG

Trol-E-Duct

FOR LIGHT

BULL D

FOR POWER

BUSTRIBUTION

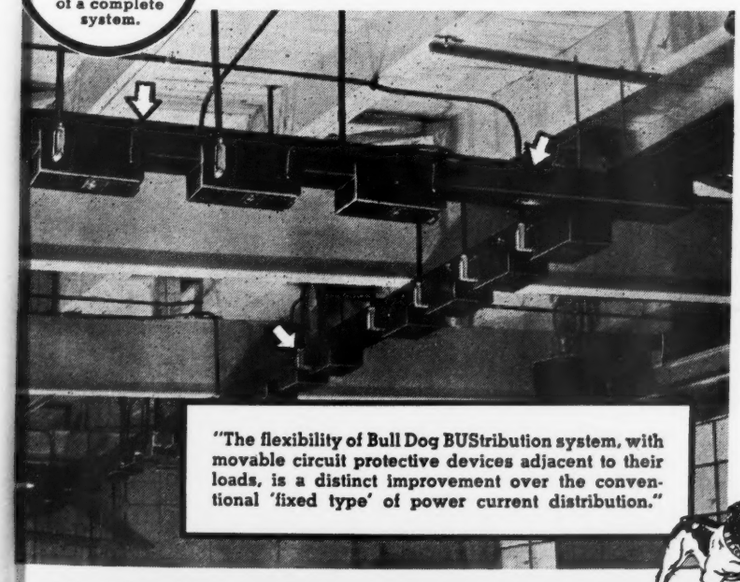
BULL DOG BUSWAY *Systems*

The KEYS

TO *REAL* FLEXIBILITY IN ELECTRICAL DISTRIBUTION

Also Available In The **5 FT. HANDY SET** . . . which can be purchased for less than **$4.00** It will enable you to judge the merits of a complete system.

"The Trol-E-Duct installation allows properly placed lighting to meet the specific needs of workmen, bringing added efficiency and increased production. Light 'When and where you want it' is the MODERN WAY."



"The flexibility of Bull Dog BUStribution system, with movable circuit protective devices adjacent to their loads, is a distinct improvement over the conventional 'fixed type' of power current distribution."

Trol•E•Duct . . . With Trol-E-Duct you can always have . . . ENOUGH OUTLETS at the RIGHT PLACE at the TIME you need them . . . because every inch of Trol-E-Duct is a potential Electrical Outlet . . . and by the use of movable Trolleys or semi-fixed twistout Plugs, Lights of any type can be quickly moved to any desired location or new units added without delay and at little expense. Available for 5 ft. or 5,000 ft. installations.

BUS TRIBUTION . . . gives you Flexible Power Circuits. It consists essentially of interconnected sections of Duct in which Busbars are mounted. Crescent shaped openings in two sides of the Duct permit the "plugging-in" of Fusible Switches, Circuit Breakers or other forms of Circuit Protective Devices at any time or at any point . . . all making for an Electric Power System that is mobile and flexible in the highest degree.

Providing Flexible Electrical Layouts . . . at Minimum Financial Outlays

WRITE FOR ILLUSTRATED BULLETINS . . . OR ASK YOUR LOCAL BULL DOG JOBBER

ADEQUATE WIRING SERVES AND SAVES

BULL DOG ELECTRIC PRODUCTS COMPANY

MANUFACTURERS OF Vacu-Break Safety Switches, Panelboards, Switchboards, Duct Systems—FOR LIGHT AND POWER

DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO, ONT.

PIONEERS OF FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

Where rust may mean disaster HOT-DIP GALVANIZING is needed

Rust is no sentimentalist. It has already caused too many accidents. In bleachers, playground equipment and structural steel athletic fixtures, there is no substitute for perfect protection . . . Only Hot Dip Galvanizing guarantees an adequately thick coating of zinc and a union between zinc coating and base metal which makes each an inseparable part of the other . . . Metallurgists will tell you that nothing serves so long for so little as Hot Dip Galvanizing. Patronize members of this association and *know* that you are getting a perfect job every time . . . Write us for literature and learn the truth about galvanizing. American Hot Dip Galvanizers Association Incorporated, American Bank Building, Pittsburgh, Pa.

Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
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Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa.
The Hodell Chain Company, Cleveland, Ohio
Independent Galvanizing Co., Newark, N. J.
International Derrick & Equipment Co., Columbus, Ohio
Joslyn Co. of California, Los Angeles, Cal.
Joslyn Mfg. & Supply Co., Chicago, Ill.
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Missouri Rolling Mill Corp., St. Louis, Mo.
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Penn Galvanizing Co., Philadelphia, Pa.
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San Francisco Galvanizing Works, San Francisco, Cal.
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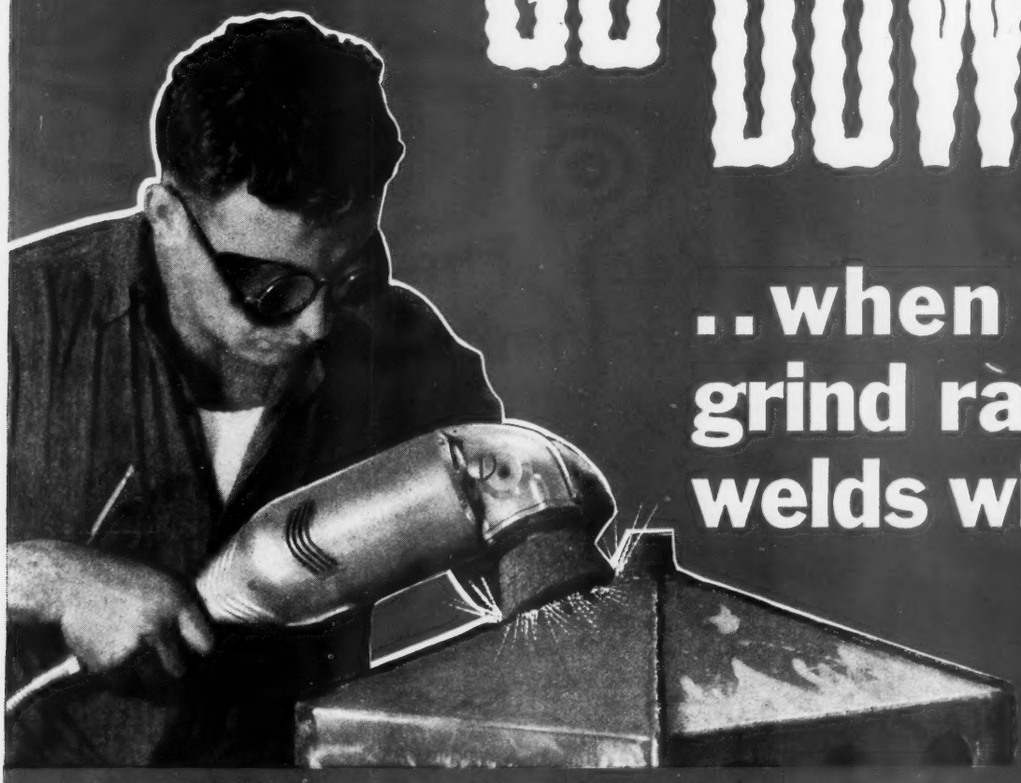

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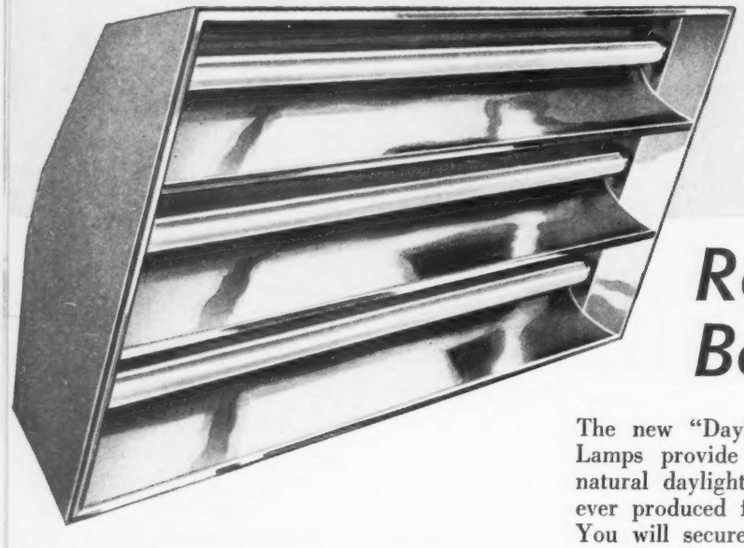

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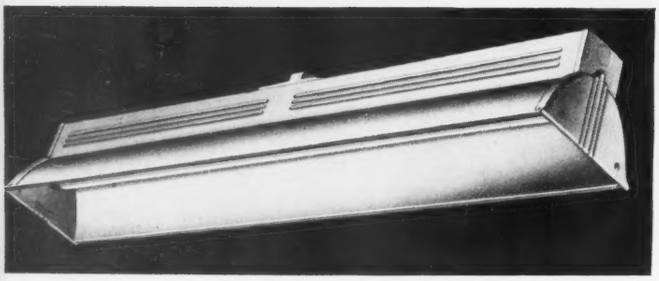

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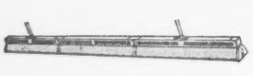

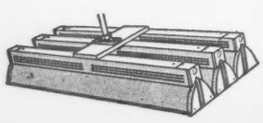

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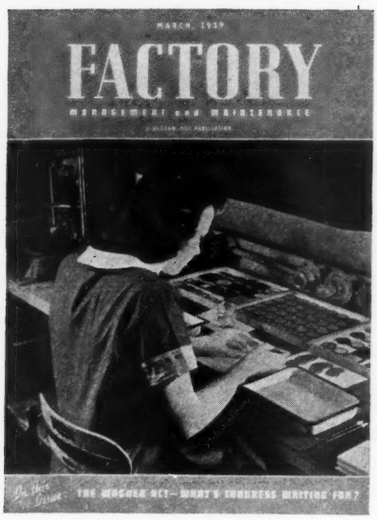

EVERY PLANT in the manufacturing industries has its inspection problems. So it is fitting that one of FACTORY's full-color cover photographs should show an inspector at work. That is what the young lady on this month's cover is. And the colored disks she is inspecting are photographic light filters. This, the third of FACTORY's four-color covers, is in line with long-time policy of giving readers the best business paper possible.

•

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FACTORY

MANAGEMENT and MAINTENANCE

MARCH, 1939

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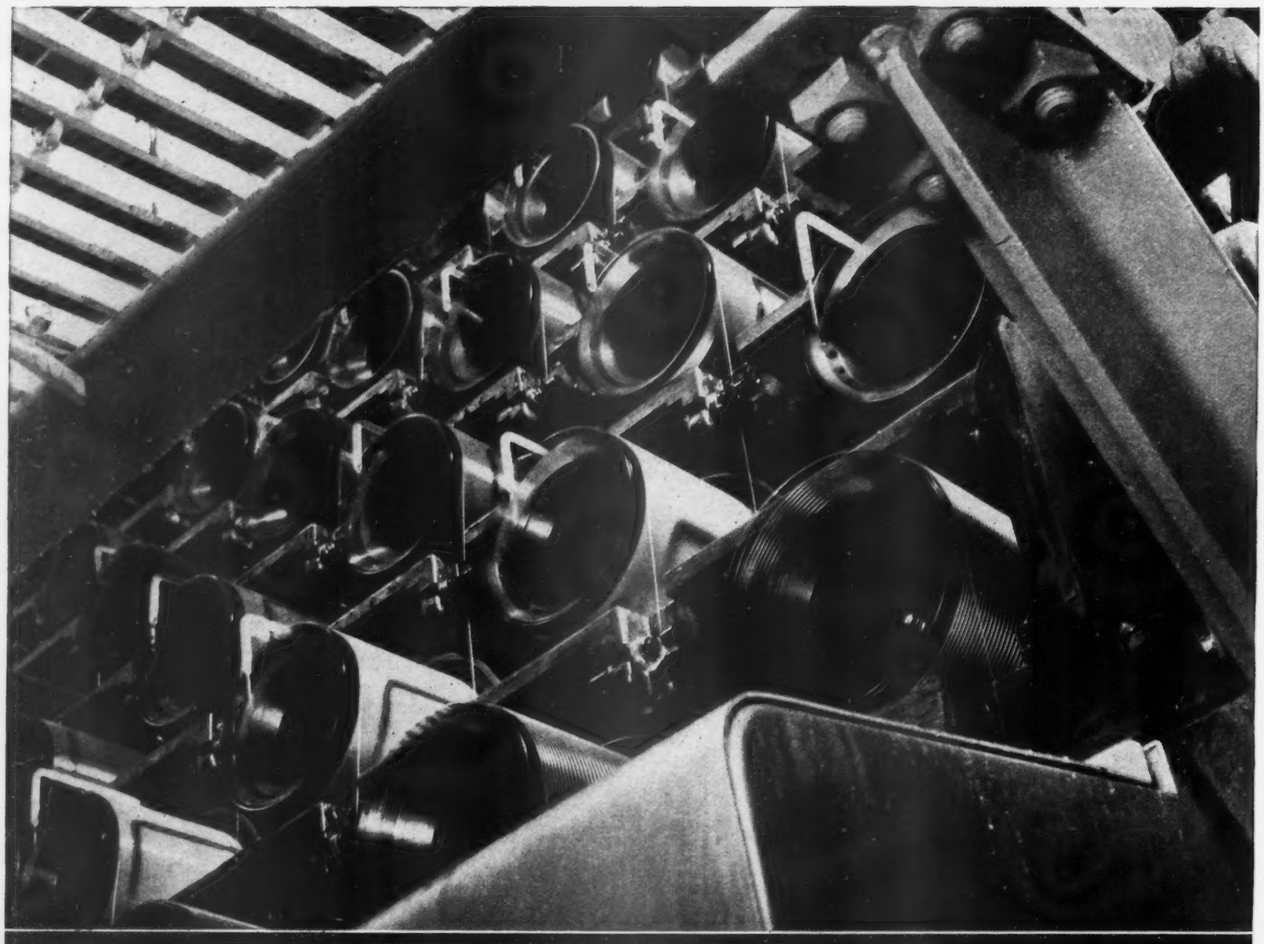

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FACTORY
MANAGEMENT and MAINTENANCE

L. C. MORROW, *EDITOR*

MANAGEMENT MUST HELP REVISE THE WAGNER ACT

FACTORY has polled Congressional opinion on changing the Wagner Act and herewith presents the results to industrial management. The balloting points toward almost certain amendment, but the nature of the revisions and the time of action remain uncertain.

Our survey of the opinion of management, published in the January issue, showed an overwhelming demand for amendment. About half of organized labor has been calling for changes. With Congress now on the amendment bandwagon, there is no valid reason for delay in getting down to cases.

What changes will be proposed, and by what method will their recommendation be decided upon?

As to organized labor, we already have the answer. AFL has taken direct action and its proposals have been introduced by Senator Walsh of Massachusetts. CIO is appealing directly to members of Congress to make no changes.

Congress itself, through the action of Senator Burke, and others, has initiated amendments that will go into the hopper.

Management has spoken—and spoken effectively—through FACTORY'S survey, made available to every member of Congress. It has spoken, also, through various ones of its associations. Management has made a good start, but there is much still to do.

Those associations that want amendments and have not advised Congress as to what they want, must do so.

Individual executives have their obligations, too. They must let their senators and representatives know what amendments they want and why they want them.

Both associations and individuals must seek opportunities to appear before any Congressional committees that hold hearings on Wagner Act revision. It is a difficult and important task that Congress faces. The members need, and want, all the help they can get.

Is management in favor of an impartial commission to study the effects of the act and recommend changes? Or does it prefer that Congressional committees hold hearings and reach conclusions without the assistance of an impartial commission? Congress would like to know. It never will know unless a considerable portion of management takes the trouble to express itself.

The Wagner Act became law on July 5, 1935. For more than three years, now, its amendment has been talked of and hoped for by industrial management. Here, at last, is management's opportunity to help itself to get that amendment. To date it has not availed itself of that opportunity. Congress is getting plenty of direct reaction from labor, little from management. The case should not be lost by default.

L. C. Morrow

Beginning on the next page — Report of FACTORY'S *poll of Congress*

Harris & Ewing Photographs

Victory seems near for Nebraska's Burke. Pioneer of the pro-amendment forces, he has introduced his own amendments, but would be willing to trust the job of recommending revisions to an impartial commission

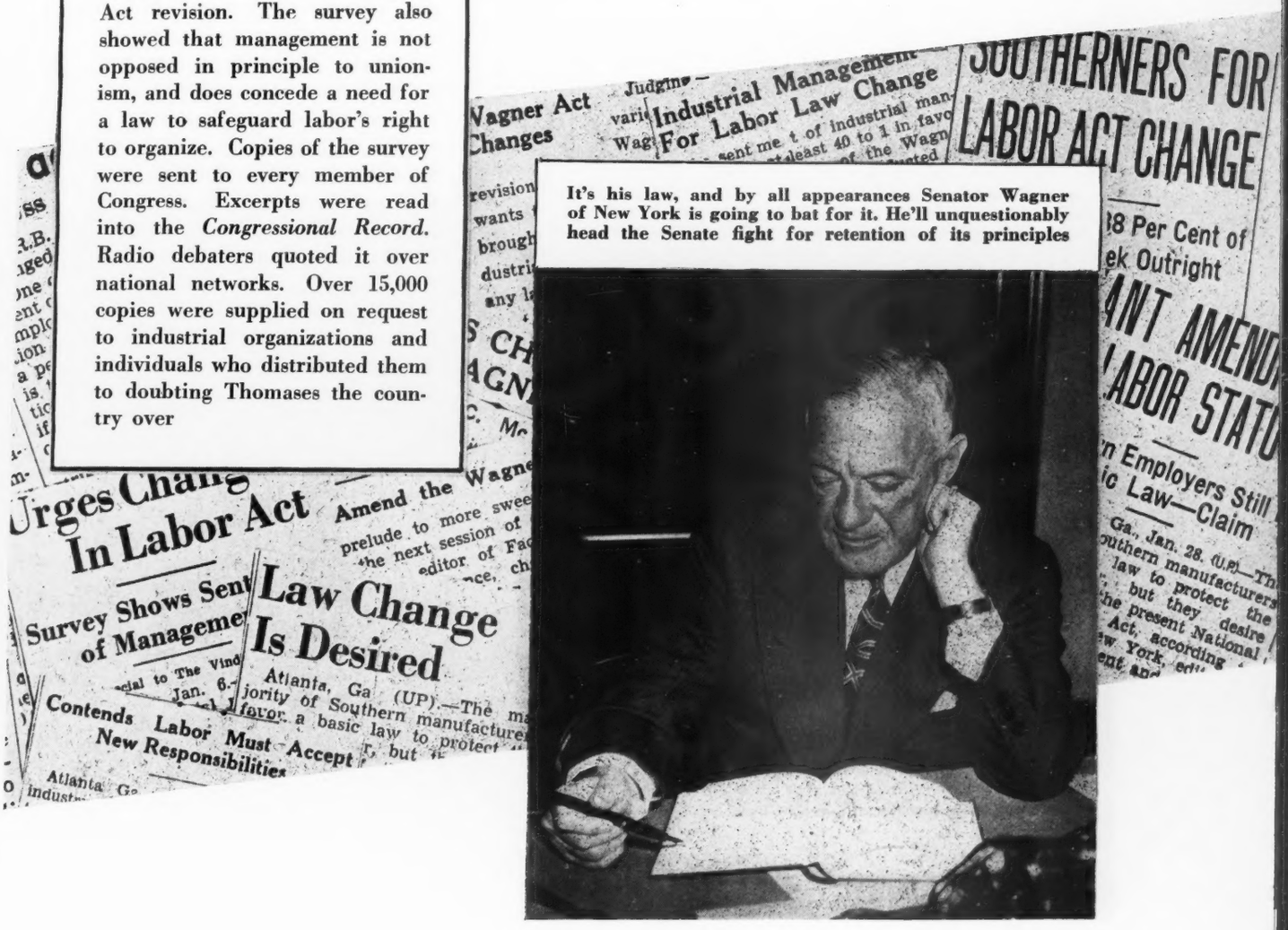
The Wagner Act—

FACTORY poll of Senate and House reveals trend to almost certain Labor Law amendment. Disagreement on method seems only obstacle. Proposal for impartial investigating commission wins wide support among lawmakers of both parties . . . Following up its January survey, which placed management's view before Congress, FACTORY now tests Congressional opinion and once again reports back to management

BENEATH the gathering weight of adverse opinion, Congressional support of the National Labor Relations Act in its present form is slowly but surely cracking up. Amendment of the act is demonstrably favored by industrial management, by the general public, by a large section of labor, and now *by Congress itself.* Action on revision at this session seems a certainty.

Management remains, three years after the act's passage, almost wholly unreconciled to its present provisions and bitterly critical of the National Labor Relations Board. This was shown in FACTORY's January survey which revealed that, of 1,500 man-

Press reports of FACTORY's January survey brought home to the public the significance of management's demand for Wagner Act revision. The survey also showed that management is not opposed in principle to unionism, and does concede a need for a law to safeguard labor's right to organize. Copies of the survey were sent to every member of Congress. Excerpts were read into the *Congressional Record.* Radio debaters quoted it over national networks. Over 15,000 copies were supplied on request to industrial organizations and individuals who distributed them to doubting Thomases the country over


Wagner Act Changes
Industrial Management For Labor Law Change
SOUTHERNERS FOR LABOR ACT CHANGE
Urges Change In Labor Act
Amend the Wagner
Survey Shows Sentiment of Management
Law Change Is Desired
Contends Labor Must Accept New Responsibilities
Atlanta, Ga (UP).—The majority of Southern manufacturers favor a basic law to protect
Employers Still Outright
Labor Law—Claim
Ga., Jan. 28. (U.P.)—The Southern manufacturers law to protect the but they desire the present National Act, according

It's his law, and by all appearances Senator Wagner of New York is going to bat for it. He'll unquestionably head the Senate fight for retention of its principles

What's Congress Waiting For?

agement men in plants throughout the country, 76% favored amendment, 23% repeal, and only 1% retention of the act "as is."

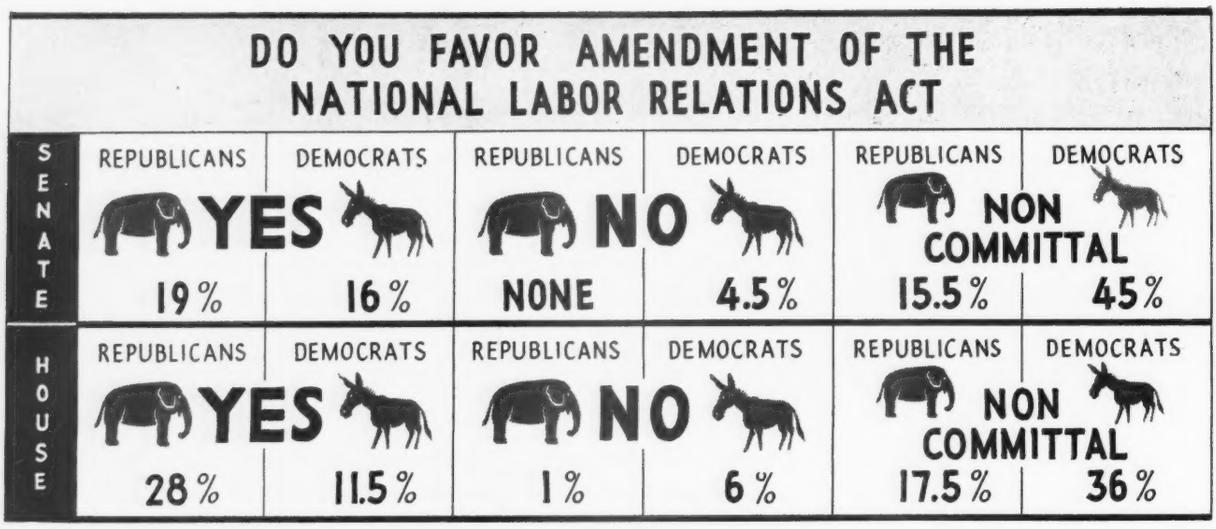
Public opinion swung to support for amendment in November. In a poll by Dr. George Gallup's Institute of Public Opinion, 52% voted for amendment, 18% for repeal, and 30% for retention. The contrast with FACTORY's management survey is considered due to the fact that management has a direct interest in the law, must work under it, is hence more emphatic in its verdict.

To these portents add the fact that the viewpoint of the American Federation of Labor has found concrete expression in a series of amendments proposed by Senator Walsh of Massachusetts, more sweeping than anyone was willing to predict as recently as three months ago. Consider also that in this action AFL leaders apparently have sensed a further shift in public sentiment.

And yet remember that no one of these factors nor any combination of them would suffice as the basis for a positive forecast of revision.

On what ground, then, is such a forecast founded? Just this: *Congress itself,* as revealed in an exclusive FACTORY poll of Senate and House appears *definitely to favor amendment.* Opinion varies greatly as to method, but on the *need* for amendment the vote is conclusive.

That being the case, *what's Congress waiting for?* There are three outstanding answers: (1) This has been, so far, an irresolute Congress split by intra-party dissension; (2) Wagner Act revision is one of the most controversial issues ever to confront any Congress and one to which an extremely wide variety of possible solutions seems open; (3) the political danger of a wrong move either way has driven a decisive element to the top of the fence. The only possibility of inaction on the issue at this session lies in the fact that the undecided groups within the Congress



Balance of power rests with the large number of noncommittal members. But of those who did commit themselves, 89.5% in the Senate and 84.5% in the House are in favor of amendment. If noncommittal voters are only evenly divided, there will be a clear majority for amendment in both houses

may not be able to get together on a course of action.

Evidence of this is found in FACTORY's poll, which shows that *there is strong sentiment, both in House and Senate, in favor of the appointment of an impartial commission to study the effects of the act and recommend changes.* This proposal, not necessarily reflecting FACTORY's views, stems from a suggestion advanced by *The New York Times* on January 27. *The Times* proposed the appointment of a commission similar to that which investigated foreign labor relations last summer, to study the whole broad field of labor relations including the Wagner Act.

The poll was taken by special representatives of FACTORY over a 10-day period in early February when Wagner Act amendment was beginning to loom as the next big issue on Capitol Hill. Pro-amendment and pro-Wagner Act groups were drawing their forces for the first open battle, following weeks of covert struggle, as the Senate Labor Committee moved toward consideration of the Walsh amendments.

Although the survey used the sampling method, it uncovered certain significant facts that may almost be regarded as conclusive.

In the Senate, 89.5% of those willing to express a positive opinion were in favor of amendment. *And 48% of these were Democrats.* Some of the leading Republicans for amendment are Vandenberg of Michigan, Taft of Ohio, both popularly regarded as presidential possibilities, Nye of North Dakota, and Capper of Kansas.

Democrats on record for amendment include, of course, Senator Burke of Nebraska, who has long led the fight for revision of the act, Senator Bailey of North Carolina (one of those who did not vote for the act originally), and Senators Herring of Iowa, Andrews of Florida, Bulow of South Dakota, Ellender of Louisiana, and Logan of Kentucky.

A surprise vote was that of Democratic Senator Mead, New York New Dealer and colleague of Senator Wagner. Mead cast a qualified vote for amendment, specifying that he would favor such changes as "will protect the principle and improve the administration" of the act.

An impressive feature of the survey was the number of Democrats who declined to express an opinion and were listed in the poll as noncommittal. Among these were Clark of Missouri, Overton of Louisiana, Bilbo of Mississippi, Sheppard of Texas, George of Georgia, McKellar of Tennessee, Byrd of Virginia, Truman of Missouri, and a number of Northern and Western Democrats. FACTORY was informed off the record that a high percentage of the noncommittal Senators, particularly from the South, were privately in favor of amendment.

A certain significance attaches also to the fact that certain New Dealers, such as Senators Smathers of New Jersey, Pepper of Florida, Van Nuys of Indiana, and Guffey of Pennsylvania were also listed as noncommittal. In the noncommittal column from the Republican side, however, were Lodge of Massachusetts, Davis of Pennsylvania, and Barbour of New Jersey.

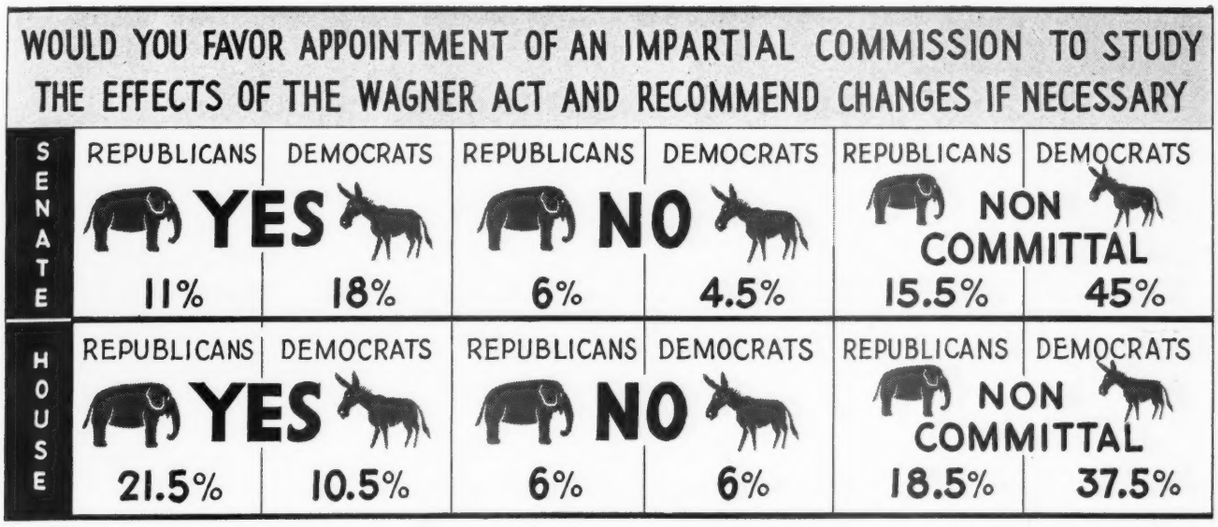
Among those who expressed opinions in defense of the act were Senator Murray, Montana Democrat, and Senator O'Mahoney, the Wyoming Democrat who heads the important Temporary National Economic Committee. Voting against amendment, Senator O'Mahoney wrote on his ballot: "I supported the original act and do not favor amending it in any way that would hurt labor."

Of the Senators who committed themselves on the amendment question 89.5% (of which 52% were Republicans) voted "Yes." Of the larger group including those as yet uncommitted, 35% voted "Yes," 4.5% voted "No," and 60.5% were noncommittal. Breakdown of the final tabulation (excluding senators absent or unavailable) shows: Republicans "Yes," 19%; Democrats "Yes," 16%; Democrats "No," 4.5%; Republicans "No," none; Republicans noncommittal, 15.5%; Democrats noncommittal, 45%.

In the House, amendment sentiment is nearly as strong. Of the committed members, 84.5% voted "Yes." The percentage of Republicans among these is notably higher, 71%, and Democratic defenders of the act seem stronger.

On the other hand, a higher percentage were willing to commit themselves in the House than in the Senate. And in the tabulation of both committed and uncommitted members, taken together, the House vote for amendment was higher. On this basis the tabulation was: For amendment, 39.5% (compared with 35% in the Senate); against amendment, 7%; and noncommittal, 53.5%.

Such factors as the November influx of Republicans in the House must be taken into account. This circumstance might affect the test vote more than it would the actual



The commission proposal finds its greatest favor with Senate Democrats and House Republicans. An almost equal percentage of members from both parties in both houses are opposed to the plan. Of those who committed themselves in this vote, 74% in the Senate and 73.5% in the House said "Yes." In an actual vote on the floor, the percentage might be much smaller. The commission proposal attracts a somewhat less thoughtful vote, perhaps, because (unlike Wagner Act amendment) it is not likely to reach a showdown

vote. But it still seems likely that the right amendment measure would poll a safe majority if only half of the as yet uncommitted members were to vote for it.

The breakdown of the House vote follows: Republicans "Yes," 28%; Democrats "Yes," 11.5%; Republicans "No," 1%; Democrats "No," 6%; Republicans noncommittal, 17.5%; Democrats noncommittal, 36%. Again, as in the Senate, analysis shows a substantial number of Southern Democrats in favor of amendment and an even larger number noncommittal.

Ramspeck Undecided

Noteworthy among the ranks of the noncommittal is Representative Ramspeck of Georgia who as a member of the House Labor Committee helped frame the original Wagner Act. He is now regarded, however, as representative of a large bloc in the House which believes that the Labor Board is more in need of correction than the act itself.

Some clarifying comments, written either on the ballots or in letters to FACTORY, follow:

"I believe in the principles of the act, but should like to have it amended so that it would be more definite in its purposes, thereby lessening the number of controversies and misunderstandings"—Rep. Clyde H. Smith, Maine Republican member of the House Labor Committee.

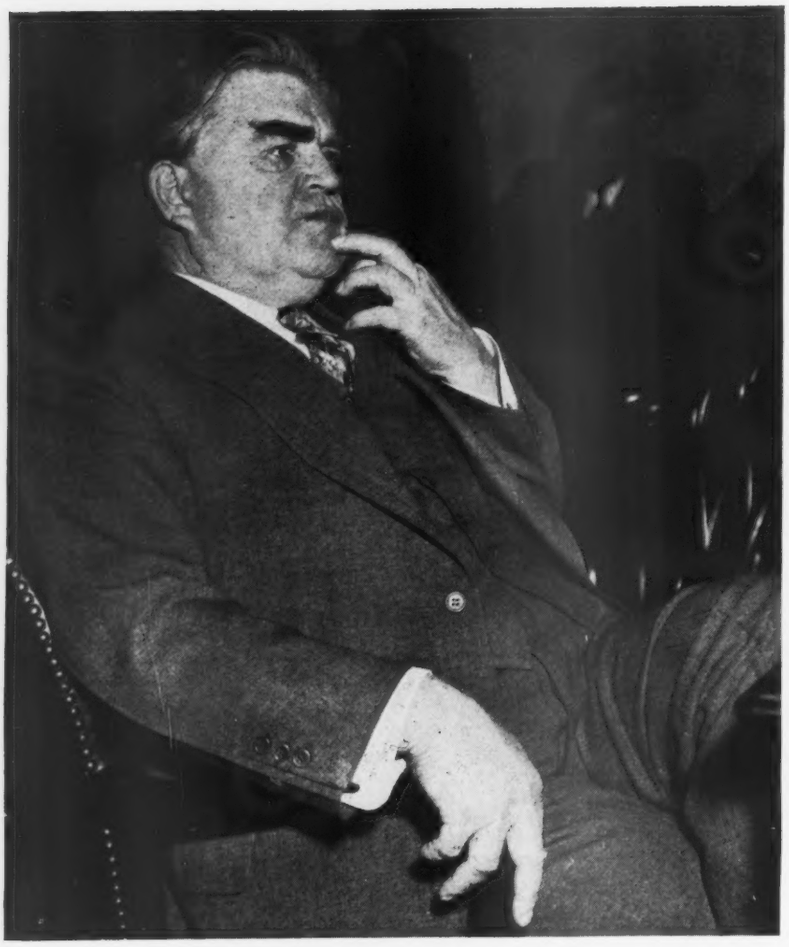
"I favor amendment only if necessary for the betterment of labor," Rep. Lawrence Connery, Massachusetts Democrat.

Representative Cox, Georgia Democrat, scribbled the single word "strongly" on the ballot on which he expressed his belief that amendment was needed. Representative Barton of New York wrote "on record." He is expected to take a leading part in the fight for amendment.

Senate support of the proposal for an impartial commission came to 74% of those expressing an opinion. Of these 67% were Democrats. Of those who voted "No," 60% were Republicans and 40% were Democrats.

The tabulation of those expressing an opinion plus those recorded as

CIO has paid Senator Walsh of Massachusetts the compliment of centering its attack on the amendments he proposed in AFL's behalf



Retention of the act hinges largely upon John L. Lewis, CIO chieftain, who has marshaled his forces for a mighty drive to keep the law intact

noncommittal (and excluding those absent, ill, or unavailable) was: "Yes," 28.5%; "No," 11%; noncommittal, 60.5%. The breakdown: Republicans, "Yes," 11%; Democrats "Yes," 18%; Republicans "No," 6%; Democrats "No," 4.5%; Republicans noncommittal, 15.5%; Democrats noncommittal, 45%.

Some of the outstanding Senators who voted in favor of this commission proposal are: Senator Burke, Senators Clark (D-Mo.), Nye (R-N.D), Overton (D-La.), and Townsend (R-Del.). The vote of Senator Burke was a surprise because he is the sponsor of his own group of amendments.

Some leading Republicans, and a few Democrats, on the other hand, oppose the commission plan. Apparently most of their objections are founded on their mistrust of official commissions rather than on any feeling that an investigation would be of no benefit. Chief objectors were Senators Vandenberg, Taft, Capper (R-Kan.), and Logan (D-Ky.).

Several expressed the view that Congress itself could do the investigation job well enough.

"I favor an impartial study, but I believe it should be done by a Congressional Committee," Senator Austin (R-Vt.) wrote on his ballot. Others echoed this thought, but Vandenberg and Taft were united in dismissing the necessity for further study.

"No reason why Congress should not act," wrote Senator Taft. "There is no such thing as an impartial commission on this issue."

Said Vandenberg: "Some necessary changes are so obvious that no study by a commission (with attendant delay) should be necessary."

Senator Bailey, on the other hand, said he would not oppose such a commission, although "I must reflect that impartial commissions have not got very far in this country. Congress is not disposed to pay much attention to them, and very often commissions are not as impartial as one would like them to be."

Of the recorded votes in the House, practically the same proportion, 73.5%, favor the commission plan as the Senate poll disclosed. A higher percentage of Republicans favor the proposal in the House than in the Senate, however. The breakdown: Republicans "Yes," 21.5%; Democrats "Yes," 10.5%; Republicans "No," 6%; Democrats "No," 6%; Republicans noncommittal 18.5%; Democrats noncommittal, 37.5%.

House objections to the plan followed the Senate pattern. Many could see no need for further study of the act. Representative Griswold of Wisconsin wrote on his ballot: "Don't we know enough already?" Others expressed belief that the Congress could—and perhaps should—make any necessary study. Among these were Representatives Ramspeck, Connery, Jensen (R-Iowa), and Thill (R-Wis.).

Endorsed by Kilday

Among those who endorsed the plan, however, were Representatives Carlson (R-Kan.), O'Day (D-N.Y.), Fish (R-N.Y.), Brewster (R-Me.), and Kilday (D-Tex.), successor to Maury Maverick of San Antonio. Kilday, incidentally, is on record in FACTORY's poll as for amendment.

FACTORY's January survey of industrial management opinion did much to pave the way for this test vote. In January FACTORY placed management's opinion on the record before Congress convened. In the present survey, FACTORY reports back to management on the views of the Congress. Taken together, the two surveys indicate that management and Congress are probably not so very far apart, after all.

Meanwhile the January survey was used widely to clarify management's position to the public. Newspaper editorials and reports quoted it extensively. Speakers referred to it in debate, among them Judge J. Raymond Tiffany, counsel to the National Small Business Men's Association, who took part in a Sunday evening forum of the Columbia Broadcasting System. L. C. Morrow, editor of FACTORY, gave additional details of the survey's findings in talks before the Southern States Industrial Conference and a committee of the National Industrial Conference Board. Over 15,000 copies of the survey were supplied on request to business organizations and individuals.

In Congress, Representative Robert F. Rich (R-Pa.) read excerpts from the survey into the *Congressional Record.*

"This survey suggests strongly the need of a change," Mr. Rich declared. "It is most imperative that we act, and at the earliest possible moment."

Whatever the outcome, the Wagner Act issue will be the cause of the most important pitched battle at this session of Congress. And of all the interested outside groups, the two with the greatest influence—AFL and CIO—are arrayed on opposite sides.

William Green, AFL's President, has hurled a challenge to the rival group in a series of strongly worded statements supporting the Walsh amendments, condemning the Labor Board, and threatening to demand an investigation of Labor Board attempts to sway labor's opinion. This he will surely do, Green says, if the reappointment of Donald Wakefield Smith is sent to the Senate for confirmation.

CIO has paid the Walsh amendments the compliment of concentrating its fire on them, but many other bills and other issues are involved in the Wagner Act fight. The Walsh amendments hold the spotlight for two reasons. They are likely to receive the most attention from the House and Senate labor committees. And they are much stronger than any proposal from a labor source was expected to be. Not only would they strengthen craft jurisdictions (anathema to CIO), but they would also give employers the right to petition for plant elections. To these may be added an additional amendment that would oust the present three members of NLRB and create a new five-man board.

But even stronger bills are before the Congress. Senator Burke has introduced a sweeping list of eight amendments which would ban union coercion, boycotts, unauthorized strikes, and contract violations as unfair labor practices. It would further revise NLRB to include representatives of management, labor, and the public, and require unions to be registered.

Other Bills Pending

Another Senate measure is in the offing. Senator Holman (R-Ore.) stated on his FACTORY ballot: "Am working on amendments myself with the aid of those who have had the most disastrous experience of any in Oregon with this law."

In the House, Representative Anderson (D-Mo.) has introduced a repealer and a substitute labor law that would confine the Labor Board to the role of prosecutor, the federal courts to judge. He has also proposed that a 10-member House committee be appointed to investigate the entire Wagner Act question and report to the House June 1.

"The Act must be changed!" is the battle cry of William Green. Outside Congress, Green is today the foremost figure in the fight for amendment

One important early skirmish, meanwhile, has been settled to the satisfaction of the act's defenders. This was the House defeat of an attempt to reduce NLRB's funds so drastically as to bring about virtual repeal of the act. This and other developments have made it plain that amendment, not repeal, is the issue.

Should Congress bog down in disagreement over all the suggested instruments for amendment, however, the proposal for an impartial commission might assume new value. And Congress, meanwhile, might well heed the advice of Charles R. Hook, President of the American Rolling Mill Company, and a member of the commission that studied labor relations in England, Sweden, and Norway. Management has given wide acceptance to the five points enunciated by Mr. Hook in a recent radio debate. These points are:

1. The mutuality of interest of employer and employee should be recognized.

2. The function of government should be that of assuring that employees shall not be subject to coercion from any source.

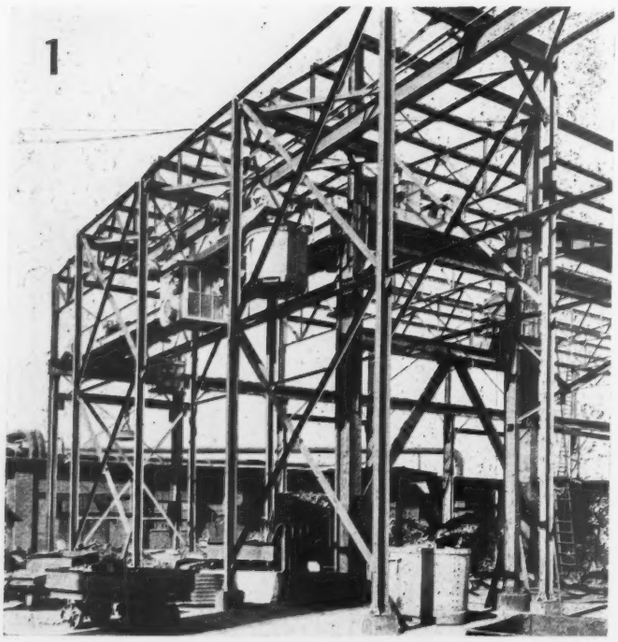
3. The emphasis on strikes should be modified. There is no emphasis at all on when it is wrong to strike.

4. There should be recognition that every man has the right to work unmolested whether or not he is a member of a labor organization.

5. The dominant philosophy guiding the act should be adequate protection of the paramount public interest. Until such protection is written into the act, the public will suffer.

And perhaps it might be added that until amendment is accomplished, the act will suffer from even greater unpopularity, a thing that may in turn damage the cause of labor. For "with public opinion, nothing can fail—without it nothing can succeed."

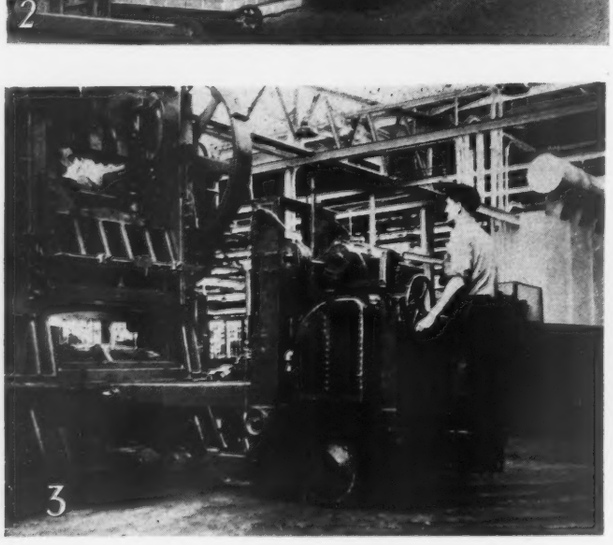
All in the Business of HANDLING



No matter what industry you're in or what product you make, chances are a big part of the business is handling materials and parts. You may be doing a good job. Or you may be a hundred years behind the times. If the one, it's doubtful whether the job is so good it can't be improved upon. If the other, you're lucky in a sense because you can start from scratch and cash in on the experience of thousands of others who have found that good handling may spell the difference between red ink and black on the operating statement. In either case, here are seven examples of what we have in mind

1. Complete mechanization (Shepard-Niles)—not only of raw materials handling but also of cupola charging—enables the Ferro Machine & Foundry Company to charge 30 tons an hour with sizable savings over old hand methods

2. Trailer lifter (Service Caster & Truck Co.) with 30-ft. lift earns its way in any plant with a storage problem



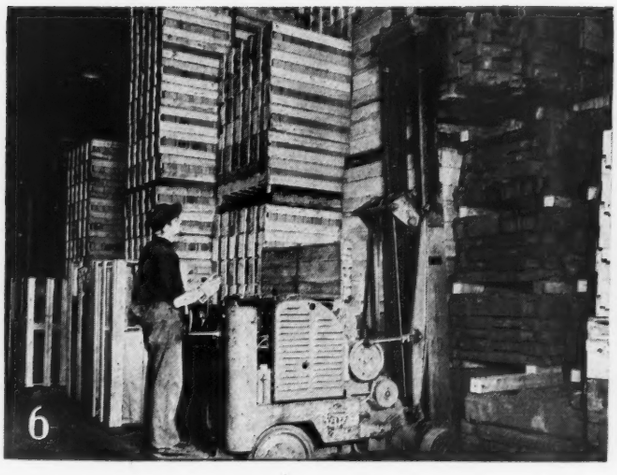
3. Five-ton high-lift (Mercury) is equipped with a power-driven double-drum winch specially designed to handle heavy automotive dies on and off presses, and into storage

4. Double-deck live-roller conveyor (Logan) serves packing department for a manufacturer of perfumes and other toilet articles. The two belts operate in the same direction, the upper handling parcel post, the lower one express

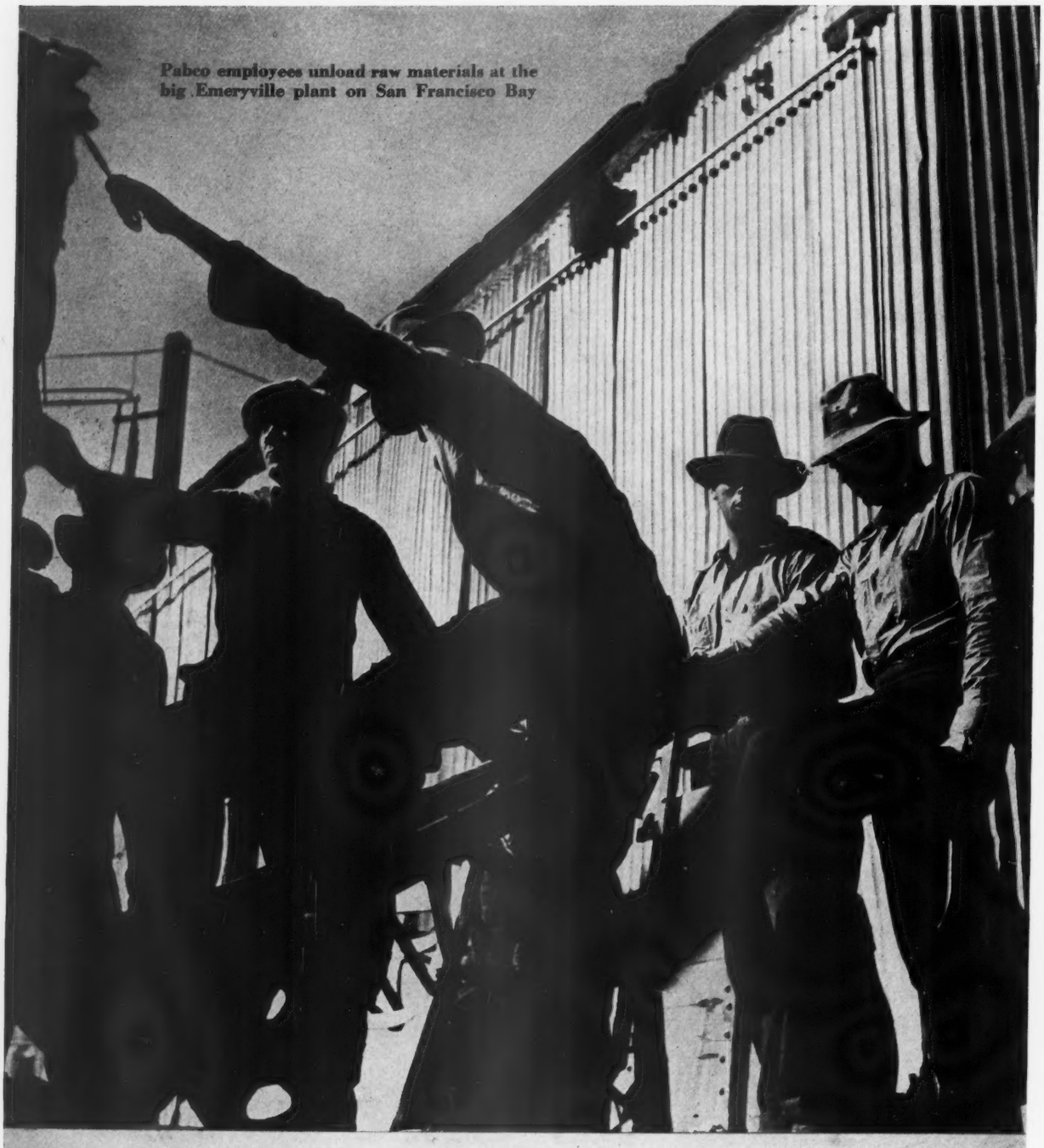
5. This 30-ton locomotive crane (Industrial Brownhoist) is diesel-operated. It handles pig iron with a lifting magnet

6. Boiler sections are child's play for this (Baker) truck

7. When new plant construction gets under way, the power shovel (Browning) goes into action with telling effect



LIVING IN PEACE *with*



Pabco employees unload raw materials at the big Emeryville plant on San Francisco Bay

PUBLIC RELATIONS: *Industry's Biggest Job*

18 UNIONS

After 53 years of open shop, the deluge—in the shape of 18 unions. How Pabco turned what looked like a liability into an asset, got better cooperation than ever before

W. H. LOWE

President, The Paraffine Companies, Inc.
San Francisco

W. H. (Bill) Lowe works hardest when the going's toughest. Every big slump his company expands. In 1921, it went into felt-base rugs; in 1931, linoleum; in 1938, a new roofing. Lowe started at Pabco in 1904 as a draftsman at 30 cents an hour, has kept in close touch with factory workers, knows how they think and feel. One of his hobbies is building prize-winning houses, naturally of Pabco products. He has had three national prize-winners. His latest copped the blue ribbon in HOUSE BEAUTIFUL'S *Western group.*

MASS UNIONIZATION swept industrial America in the spring of 1937. As organizers moved from factory to factory, they left concrete mementoes for management to face and combat. Wage rates had been upped, hours of work cut. The net pay-off was increased production costs.

It was in April of that year that the huge Pabco Plant No. 1 at Oakland was unionized. For 53 years it had operated under open-shop conditions. Overnight there was a change. Bitten by the union fever, our men took out union cards. Eighteen different unions—some CIO, some AFL, emerged. Included were the warring AFL teamsters and CIO warehousemen.

Agreements were signed. And although we were already paying the highest wage rates in our industry, the payroll was increased heavily. Our manufacturing costs naturally should have gone out of kilter. But they didn't!

Why not? We are asked that many times a day.

Well, when you pay more for an item, you generally get more of it. Why not when labor costs are increased?

That's the position Pabco properly took.

Now I trust none of FACTORY'S readers will get the idea we're self-satisfied, cocky, or conceited about our labor program. We're not. We're iron realists on the subject of labor relations. Life on the labor-tossed Pacific Coast makes you that way.

When the eighteen unions popped up at Pabco, the management was shocked. For over the years the company had gained a reputation for its fine relationships with employees. Short hours, high wages, steady employment, free insurance, and superior working conditions prevailed. Pabco was the first Pacific Coast firm to give vacations with pay to factory employees. By the way, our company has 55 plants and some 6,000 factory employees. Our products are linoleum, felt-base rugs and yard goods, paint, roofing, insulation materials, wallboard, pipe wrapping, cardboard and glass containers, paper pails and cartons, shipping cartons, and mulch paper.

So, to get back to our story, when negotiations between executives and employee representatives began, management often thought of Shakespeare's "how sharper than a serpent's tooth it is to have a thankless child,"

Negotiations bristled with wrangling, criticism, suspicion.

Here was a tough nut for management to crack. Eighteen unions composed of dissatisfied men. And Pabco well knew the statement AFL President Samuel Gompers made in 1887: "The first thing a new union does is want to strike. It overestimates the power of organization without resources. The old unions do not strike; their strength is known."

So Pabco acted. Let's make the situation an asset, became the watchword.

Now, 18 months later, an appraisal can be made. The ledger shows increased employee efficiency and cooperation. You bet that helps factory costs.

The job that did it was simple. Our original personnel program, a fundamentally sound one, was adjusted to meet changed conditions.

How was it done? Top management reaffirmed its belief in an enlightened personnel program, saw to it that it was understood up and down the line.

Management learned that the company's liberal policies had not percolated. Basically there were three reasons for management's not knowing this before. First, because the company had expanded so rapidly; even the depression didn't abate Pabco's growth. Second, because employees during the depression, knowing jobs were at a minimum,

The Can Shop . . . Originally installed to make all of the tin containers for P & B and Pabco Paints, the can shop at the Pabco plant at Emeryville now makes a variety of sheet products, including discs, etc., cut from felt and felt base floor covering. The largest production is in steel containers for asphalt—these hold about 470 pounds net.

This brief story of "The Can Shop" and the one on the facing page about "The Chinese Wall We Broke" are sample pages from the *Pabco Book of Knowledge*. Two similar pages are distributed each week to all employees. One page describes a phase of the business; the other is institutional advertising designed to give employees a better notion of "what it's all about"

were uncomplaining and not as articulate about fancied grievances as they are now. Third, because there was then no direct link between management and employees.

We learned one surprising fact. The policies we had so fondly and proudly promulgated in executive offices had been lost in the shuffle. They were unrecognizable by the time they reached the foremen and the employees. They were often misunderstood, confused, and misapplied, or through lack of knowledge not used.

This is what we did. The personnel and industrial relations department was made directly responsible to the president's office.

Personnel policies were carefully studied and reduced to writing. Now there can be no excuse for not knowing them.

A flexible but specific easy-to-understand 50-point labor program was formulated. This summarized the personnel activities of the company. Comprehensiveness is its outstanding trait.

Then the company undertook a campaign of selling itself and its policies to employees. This job should have been done long ago.

This is the company's most vital merchandising job today. It is done by word of mouth and graphically. All the arts of advertising and publicity are used to make the messages vivid and simple to understand. Art, photography, type, layout, color, copy, and themes are selected by experts. The copy is brief, informative, and interesting. Stopper pictures are used in profusion. *And everything said is on the level.*

Two pages for a loose-leaf volume are distributed each week. One of these pages tells an interesting story about a phase of the company's business. It discusses raw materials, maintenance work, manufacturing processes, uses of finished goods. Or there are charts showing how, for instance, the Pabco dollar is distributed —how much more goes to labor than to stockholders.

Can Others Do It?

The companion piece is institutional advertising. The advantages of working for the company are pointed out; the world-wide market for its products is dramatized; problems are listed. A short questionnaire for employees accompanies the pages. Prizes—210 of them—are awarded for the best answers to these quizzes.

Can other firms do what we have done? Why not? Our public relations department reduces the program to this brief formula:

1. Get understanding and knowledge of labor's points of view.
2. Know management's situation equally well.
3. Have management remove the bugs if there are any in its set-up.
4. When management's "house is clean," sell the story to employees.
5. At the same time try as far as the law permits to get employees to stop offensive practices.

Did the program cost much? Actually we saved money. The work of the personnel department was sharply cut with the drop in grievance meetings and other complaint duties. Highly paid executives previously lost many hours a week on labor matters. Now they are back at their specialties and doing the work for which they were hired. In brain sweat the program cost a lot at the beginning. But it was worth it.

Did we hire outside help? No, it was unnecessary. There are sound objections to hiring outsiders. It is practically an admission of guilt and of inability to cope with the situation. One's executive organization is upset by the entry of a new dynamic force. It takes outsiders a long time to get the "feel" of a big organization and to learn all the angles. Newcomers are subject to political pressure from labor and ambitious executives.

In our case, our technical and executive man power was slightly rearranged. Certain authority was increased, and the job was on.

These are only the highlights of the story. We've tried hard, but we keep our fingers crossed.

The facts, however, are that increased employee efficiency and cooperation resulted after unionization. That's helping factory management meet costs.

Now if we were all sitting down together in the grand ballroom of the Waldorf or the Palmer House, this would be the right time for the chairman to announce that "Mr. Lowe is willing to answer questions." And I can see you jumping up, a dozen at a time, in an effort to catch his eye. So perhaps I'd better anticipate at least some of your queries with our answers to the five most commonly asked:

1. What sort of contracts do you have? Do you deal separately with the 18 unions? or how?

With each pair of pages for the *Pabco Book of Knowledge* goes a simple quiz like the one below; prizes are given for the best answers

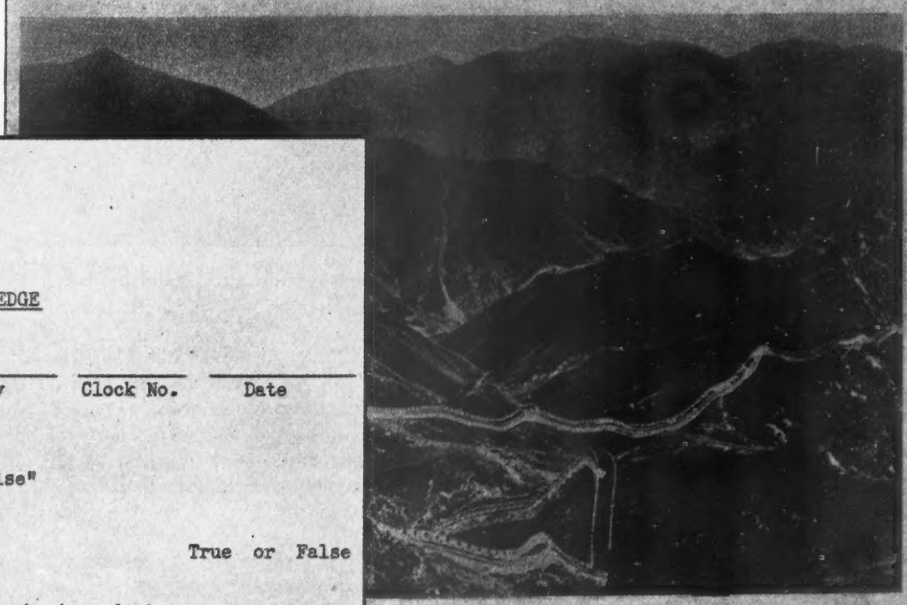
THE CHINESE WALL WE BROKE

PABCO PRODUCTS are sold east of the Mississippi. 75% of our felt-base floor covering is bought East of the Rocky Mountains.

Why is this important to all of us? Because:

PABCO is the only commodity made in the West that has been able to break through the Chinese Wall that keeps out Pacific Coast-made goods. This Chinese rampart is partly caused by lower wages, longer hours, less favorable working conditions of Eastern labor. Elements cheapening production costs.

Only through increasing efficiency and cooperation is it possible to continue selling in the East PABCO goods made by PABCO men and women getting high wages, short hours, opportunities and favorable working conditions.



(CAN SHOP)
(CHINESE WALL WE BROKE)

PABCO BOOK OF KNOWLEDGE

Contestant's Name _____ Employee or Family _____ Clock No. _____ Date _____

Mark "True" or "False"

	True or False
1. Can Shop was originally installed to make sheet products	_____ _____
2. Asphalt containers hold 470 pounds	_____ _____
3. A variety of sheet products are now made	_____ _____
4. Pabco Products are sold only in the West	_____ _____
5. The Chinese Wall comes from lower wages and longer hours	_____ _____

6. Discuss "The Chinese Wall"
(Use more than 10 and less than 25 words)

(Do not write Below this Line)

There is nothing unusual about our contracts. Each is signed by the plant committee representing the employees and the local outside business representative. The latter also represents the International Printing Pressmen and Assistants Union of North America. In some cases the contract is countersigned by the International. Generally speaking, we deal separately with the unions. All are treated exactly alike—and they know it.

2. How do you handle jurisdictional problems with CIO and AFL?

So far none has ever come to a head. We constantly drill it into the

This man who inspects felt-base rugs knows more now about his company's business, is a better employee for it

men's minds that we can be a party to no jurisdictional dispute. In fact, our contracts specify that we shall not be called on to act in any jurisdictional matter.

There have been so many disputes of this sort in this district that responsible employees are well aware of the suffering involved. We also appeal to the unions for cooperation in minimizing these problems.

In our contracts the jurisdiction of each union is specifically designated. At the first whisper of a problem, the facts are ascertained, conferences are held, the position is explained to everyone's satisfaction, every effort is made to reach an understanding.

3. How does your company handle employees' grievances?

Employees know that we maintain the open-door policy. They may appeal all the way up the line to the president or the chairman of the board. A man with a grievance is urged to take it up first with his foreman, then with his department head, and so on up. The procedure is outlined in the contracts we make.

Foremen, and their superiors as well, have been trained both in the handling of grievances and in the handling of men. This is an activity that is closely supervised by the personnel and industrial relations department.

4. Tell us, please, how you get higher output.

This higher output I've been talking about is in excess of the higher output that can be ascribed to technological advancement, improved machinery, etc. It can be traced right back to increased employee cooperation. Not only have we got this better output, but a program of smooth relationship with the unions is minimizing the amount of time that high-paid factory executives have to spend at meetings with the unions.

Higher output is not all we get. Through employee cooperation we have also reduced waste, spoilage, tool and machinery damage. Our products are better. So is our service to customers. We have fewer breakdowns. The men schedule their work better. Equipment and machinery are properly used. There has been an increasing number of suggestions from employees—in general just a better spirit all around.

Take waste, for instance. In a big plant this can run into thousands of dollars. Cutting it down has been a big help in our over-all attack on production costs.

5. Has your company had any strikes?

No. Not only have we had no strikes, but fortunately—and here we thank our lucky stars—we've had no stoppages of work, no "quickies," no slowdowns, no threats of any kind in a district that fairly bristles with strikes and stoppages.

I hope all this doesn't sound like bragging. I certainly do not want to give that impression. We know that today's labor peace in our own plants might be completely shattered tomorrow by a coast-wide strike caused by circumstances beyond our control. We're just trying to do our level best to cooperate—using common sense, fairness, and the best techniques we know about.

10 YEARS ON GROUP BONUS

EARNINGS UP 15 PER CENT

Eight men on group bonus in this packing room have averaged 15 per cent above base pay

Bonus Drops Packing Costs 10%

W. C. OWEN

Vice-President, Detroit Steel Products Company
Detroit

MANY PEOPLE claim a bonus for packing room employees doesn't do. The work, they say, is too diversified. My answer to that is, our work is *plenty* diversified, yet our packers and shippers have been on group bonus for more than 10 years. Costs have been 10 per cent lower over the period. And, year in and year out, the men have earned close to 15 per cent above base pay. A further benefit is derived from the fact that the men, working as a small group, voluntarily help one another out as occasion arises, which tends to lighten the load on supervision.

We ship up to 100 tons of fittings a month, ranging from wood screws to big mechanical fittings weighing 180 pounds. The bulk of the work, however, is packing the fittings used on steel sash. Incidentally, shipping the sash itself is not included in this group bonus; it is loaded into car or truck by men in another department.

The normal force covered by the bonus plan consists of two receiving department employees, two office clerks, one window attendant to deliver parts on shop requisitions, and three packers—a total of eight people. Fittings are received, stored, issued to

the shop, and packed for shipment to customers. Many types of fittings are required for the diversified line of sash produced, and at the same time the size of order varies over a wide range, all of which complicates the calculation of standards upon which the bonus is based.

Analyzed Orders

This group of eight men, which may increase at peak production, is paid on a group bonus basis. Hourly base rates differ, however, according to the type of work performed.

A basic unit was established by analyzing orders for a year or two to determine the most popular type of sash sold. At the same time the average number of sash per order was figured, as well as the quantity of erection fittings, hardware and operator parts, and other items that must be packed on this average order.

Two measures were utilized to establish the time it should take to pack these fittings—timestudy and past experience. Timestudies on test runs gave the times needed for the various packing tasks. These times had to be tempered by experience, of course, since clerical work, receiving, and window attendance on shop requisitions would not ordinarily figure into the packing of a specific box of fittings. By this method the man-hour requirements for the average order were set.

Another factor had to be considered. There are certain fixed and constant elements applicable to each order which are not affected by the type or quantity of fittings packed. These constant elements are: Get order, see what has to be packed, get the box, weigh the box after it is packed, close box, attach shipping instructions.

These elements are constant for each order; the only variation would be if more than one box is required. If two are needed, then the basic time for one box is increased, and so on for a greater number. The time for these constant elements was determined by timestudy of the operations.

The basic time, excluding the fixed elements, was considered as one unit, or the base unit. But sash must be shipped that requires different numbers and types of fittings than called for by this base unit. Consequently ratios had to be calculated so that the work involved in packing one box of any type fittings might be expressed as a fraction of the average order. With such multipliers the payroll department can easily translate any

Fresh out of Lehigh, Mr. Owen went in 1914 to Detroit Steel Products as assistant to the superintendent of the Fenestra Sash Division. He's been there ever since. The intervening years have seen him move up through the Fenestra Sash and the Spring Divisions to general superintendent, later general manager, of all plants. Now he is vice-president in charge of all manufacturing.

combination of fittings shipped into multiples of the base unit to establish the total output of the group.

An illustration will clarify the point. Let us assume that the fixed time in packing an order is X. Let us assume further that for the average-size order of the most popular type of sash, the time to handle, count, and box one kind of fitting is 1/5X. Let us assume that there are five kinds of fittings required for this type of sash. Then total time required is $X + (5 \times 1/5X) = 2X$.

How Ratios Were Set

This will mean that an amount of work equivalent to 2X is required for the average-size order of this type of sash which, we will assume, is an order for 20 sash. $2X \div 20$ or $0.1X$ then represents one unit of work, which we call the base unit.

Another type of sash may average 15 sash per order and have 10 kinds of fittings to pack. Then total time required is $(X + (10 \times 1/5X) = 3X$, and $3X \div 15 = 0.2X$.

In this case the work required to pack fittings per sash shipped is double that required in the first case, and represents two base units of work. The payroll department, using the shipping schedule, would multiply the number of standard sash shipped in the week by one, and all of the second type by two, to establish the total work units for the week. With six general types of sash, each with many variations, a typical weekly shipping schedule would be sure to include many more than these two that have been assumed for illustration.

The Bonus Percentage

The net result of this computation is a table of multipliers or ratios of each type of sash to the most popular. These range from 0.4 to 20, depending upon the average size of order and the varying number of types of fittings required, the base being 1. However, 90 per cent of the shipments fall within the range from 1 to 2.

Next step is calculation of the bonus percentage to be added to the base rate of each man.

The point where the bonus begins has been determined as 18 units of work per man-hour. Experience indicates that in this type of work the men will produce from 18 to 21 units per man-hour. If more units than this are produced, it is due to a chance combination of orders.

For 18 to 18½ units of work per man-hour, a bonus of 3 per cent is added to each base rate, and a varying percentage is paid for increases above this level, till at 21 units or over 15 per cent bonus is paid.

Eight men in this group, working 40 hours per week, a total of 320 man-hours per week, and with the bonus beginning at 18 units per hour, should produce 5,760 units to qualify for the bonus of 3 per cent. Table I shows a typical combination of shipments that will just make bonus.

The payroll department receives a daily report of the sash shipped. The payroll computation for a week's shipment is a matter of a few minutes. Once set, the base unit and ratios of other types of sash rarely require revision. In fact the plan has operated for 10 years with a minimum of attention.

TABLE I. TYPICAL WEEK'S WORK JUST MAKING 3% BONUS

Type of Sash	*Number Shipped During Week*	*Ratio to Base*	*Units of Work*
1	2,000	1.0	2,000
2	1,500	1.2	1,800
3	500	2.0	1,000
4	400	0.4	160
5	1,000	0.6	600
6	10	20.0	200
			5,760

THE ABC's OF PERSONNEL

Five more alphabetic tips from a plant operating man who has been through the mill, hence knows whereof he writes. Next month the G's and the H's

CHARLES S. STEVENSON
General Manager, Hall Brothers, Inc., Kansas City, Mo.
SKETCHES BY MATHILDE SCHULZ MUELLER

Enigma

"Why didn't Burns get the accounting job?" the treasurer asked. "Well, it's an odd case. Some folks fail to progress because of their tendency to talk and gossip . . . this fellow missed his promotion because he didn't talk enough. I never was sure of what he was thinking. For example, he never spoke of anything he did at nights . . . and nobody seemed to know about his vacations . . . he never mentioned his ambitions, his folks,

his home, any girl friends. I don't expect a running report of a man's activities, but—well, he was just so tight-lipped I couldn't figure him out . . . couldn't tell whether he was for us or against us. In other words, I never felt sure of him. He was always a kind of puzzle . . . *an enigma* . . . to me."

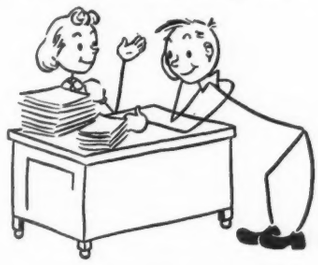
Enthusiasm

A group of World War veterans, discussing a proposed memorial, decided not to proceed with the enterprise, those present appearing only mildly interested. An ex-major, noted more for the vigor and fervor of his speech than for his accomplishments, arrived late at the meeting, but in less than 20 minutes, by nothing more than the sheer enthusiasm of his presentation, he not only sold the men the idea of the memorial, but also organized them into competitive teams and received from them pledges of $300.

The major stepped out of the picture, made no further talks, was present at no other meetings, and made no contribution himself, but in four months the desultory committee had raised the required funds. It would be too much to say that all a person needs is enthusiasm, but *a batch of enthusiasm is a mighty good buffer for a few weaknesses.*

Familiarity

The office manager of an insurance company employing 90 girls addresses everyone as *Miss* Walker or *Miss* Leonard, calling no one by her first name. His story is that as a beginner he tried to bolster his own prestige by calling everyone *Miss,* hoping all would address him as *Mister.* As he advanced, he decided to avoid all evidences of familiarity. There was no lolling on desks . . . no intentional shoulder brushings . . . never



the use of the general accepted "damn's" and "hell's." With the men, no playful hair ruffling . . . no body-smacking greetings . . . it was "Good morning, Ralph" to the office boy—not "Hi there, Speedy." That's *not* why he is office manager, of course, but it *is* why he's a highly regarded person. *He distinguished between friendliness and familiarity.*

Favorites

"She gets away with murder—comes in late, stays home any time she wants to, leaves the office for cokes, makes a lot of personal 'phone calls—she's one of the boss's favorites!" said Sally to Billy about Peggy. "Well," he replied "Dick's got the same drag. His expense accounts are never checked, he goes out for cokes, too, drives the company car for personal use at night, takes two hours for lunch whenever he chooses, and does a lot of other things." Common conversation!

If you are a manager, foreman, or supervisor with a penchant for favorites, you are in your own way and a handicap to those so favored. Jealousies, resentments, animosities, and hostility breed from favoritism . . . and while it is human nature to like some better than others, *be sure not to confuse affability with ability.*

Finances

How a person handles his pay check is a guide to his character, habits and ambitions . . . those interested in positions of trust and responsibility must demonstrate their ability to handle their own finances in a sensible, intelligent manner, or find themselves subject to the suspicions of the world. Extravagance in clothes can react unfavorably as can excess expenditures for smoking and entertainment. On the other hand, too much thriftiness in contributing to funds for flowers, charity, and such is scorned.

To borrow from a co-worker just before payday is not evidence of particularly good management . . . neither, as a general rule, is a request for an advance on your check. Asking for the pay envelope the day before it is due leaves a wondering impression. *Carelessness with your money is about the same as carelessness with your opportunity!*

HOBBY SHOW

Thinking of running one? Then read about Warner & Swasey's and see if you don't get a lot of help from the recommendations made by its hobby committee

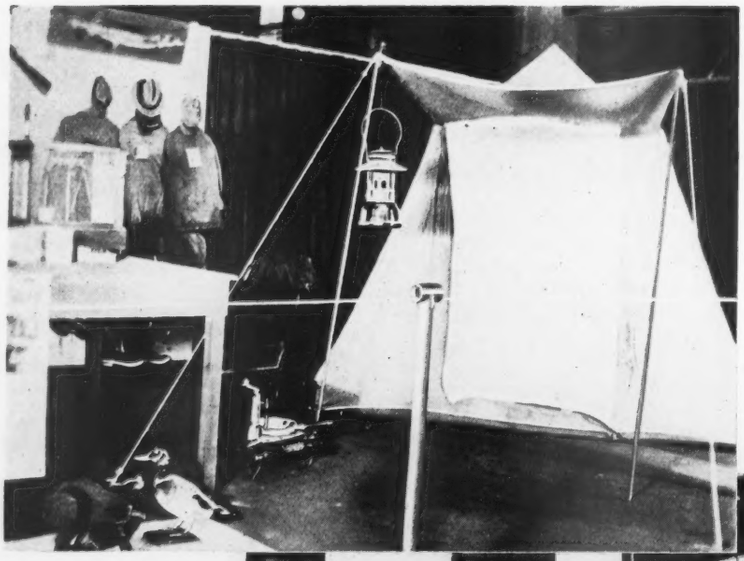
JOHN C. KLINE
Supervisor of Purchases, The Warner & Swasey Company, Cleveland

ALTHOUGH THE IDEA of an employees' hobby show was by no means new, we had never had any experience with one, and we couldn't find any other manufacturing concern in our area that had. It was, therefore, with many misgivings that plans for the show were made. Yet, from every standpoint, it turned out to be one of the best open-house features we have ever had, with exhibits displayed by 85 employees.

Most surprising thing, outside of the tremendous interest aroused, was the quality of the exhibits. Everything from live chickens and tanks of tropical fish to a model machine shop and a complete hunting and fishing camp were brought to the plant and proudly put on display. There were models of sailboats, steam engines, and airplanes. There were collections of stamps, coins, match books, and pipes. There were mounted butterflies, and tulip bulbs and doilies.

The crowds became so absorbed in these things, and stayed so long asking questions about them, that only 5,600 of the more than 7,000 open-house visitors could get into the wing of the building that housed the hobby exhibits. All the local newspapers gave the show considerable publicity. And in almost every department in the plant non-exhibitors are still telling about the things they are going to put on display next year.

Considerable planning was necessary. And from our experience this year we know future shows will require even more.



This complete hunting and fishing camp had everything but the mosquitoes

Roped aisles kept the spectator stream moving in the art gallery, where artists and photographers showed how they had been spending their hours outside the plant

About six weeks before the open house date, we sent cards announcing the hobby show to all employees. The six weeks' notice was not quite enough. Any number of people said later they had collections, or would like to make displays of their hobbies, but couldn't get them ready for exhibition on such short notice. Six months' notice is probably not too much. One man had a model boat that took him two-and-a-half years to build.

Made a Scale Drawing

When those interested in exhibiting their hobbies returned their announcement cards, they were sent the entry blank. The filled-in entry blanks gave us all the information necessary to allocate the space and to prepare a scale drawing of the entire show, including every chair and table in its proper location. With the detailed master drawing there was a minimum amount of confusion and misunderstanding when it came time actually to put the show together.

All the materials requested by the exhibitors, such as showcases, tables, plywood board, and so on, were furnished by the company. The requests for this display material were entirely reasonable; not one had to be questioned.

Getting all this display material and equipment, which we thought would be quite a problem, solved itself easily. A local firm in the business of supplying conventions and exhibitions was able to rent practically everything we needed, and set it all up according to our specifications for considerably less than we could build it. This concern built a wall of blue velour drapes 8 feet high around the hobby-show space, supplied floodlights, and, where necessary, covered the tables and displays with drapes. This equipment was all in place two days before the show.

The aisles were made by setting up posts of 1¼-in. pipe on 2x6-in. planks, and running 1-in. rope through the tees. This material was salvaged 100 per cent, of course.

A few days before open house, each exhibitor was furnished with a display card and asked to print on it his name and a short description of his exhibit. These cards, we found, should be at least 8x10 inches. Careful instructions regarding the setting up of exhibits, parking space for exhibitors, and attendance of exhibitors at the

(Continued on page 112)

OPEN HOUSE HOBBY SHOW ENTRY BLANK

To be returned within 10 days to Employment Office

NAME_____ DEPARTMENT_____

Complete description of display:

1. What is it? (Give details)_____

2. Space required - length - depth - height?_____

   Floor space_____
   Counter space_____
   Wall space_____
   Show case_____

3. Value in dollars_____

4. Is exhibit insured?_____

What material will you need to have this committee furnish to display your hobby properly?_____

What material will you furnish to display your hobby, aside from the hobby itself? You will be expected to arrange your own display.

All material must be ready, complete, three days before Open House.

A watchman will guard all displays while here.

Time required for set-up._____

You will be advised later when to have your material here.

Can you spend some time with your exhibit; if so, when?_____
(Preferably from 12 o'clock to 5 o'clock.)

You must prepare a display card for your exhibit giving your name and such other information as you desire. You will letter this yourself in black india ink. Cards will be furnished by the Committee.

Bill Klick, machinist, who mounts birds and animals as his hobby, arranged some of his specimens in a much looked-at exhibit

The Labor Audit—a Check-Up

Relations between employers and employees are far from being scientifically faced, far from being resolved on the basis of cooperatively obtained facts. The labor audit proposed by Doctor Metcalf supplies the scientific approach so badly needed. Its systematic check-up is the first step on the road to a constructive labor relations policy

HENRY C. METCALF

Director, Bureau of Personnel Administration
New York

A QUARTER of a century ago, Robert G. Valentine, one of our foremost pioneers in personnel administration, and a devoted student of science in the service of democracy, wrote: "We are staggered today by the great new forces adrift in the world. These forces become manageable before the attack of the scientific mind humanly purposed." And "the scientific mind humanly purposed" is the greatest need in industrial and labor leadership today.

For meeting this new business need, Valentine, with sound prophetic vision, put forth two inseparable techniques —the one, a scientific, the other, a human, instrument—the *labor audit* and *collective bargaining*. He recognized the wisdom of having the "consent" of the workers. He believed in finding, facing, and using facts, cooperatively. What he and a few others appreciated and strove for long ago is now becoming more generally recognized as sound and necessary.

The labor audit is the initial step in getting the facts upon which sound personnel policies and collective bargaining agreements can be based. As defined by Ordway Tead and myself,* it is *a systematic and reasonably exhaustive analysis and statement of the facts and forces in an organization which affect the relations between employees and management, and their work, followed by recommendations as to ways of making the organization more socially and humanly productive and solvent.*

The word "audit" itself suggests the ends in view. Just as the sales audit and the financial audit render a report indicating the degree to which the organization's policy and practice in these fields are sound and solvent, so the labor audit evaluates personnel policies and procedures.

Managers are familiar with various types of accurate current reports regarding different phases of operating activity. There are elaborate balance-of-store records, production records, and analyses of selling conditions. The labor audit, in turn, is a well-organized method for analyzing and recording the elements that go to make up what is in many businesses one of the largest classes of expense—namely, labor costs.

An audit may be made of a single plant, of a company—small, medium, or large—or of an entire industry, as determined by existing conditions. It is an instrument of wide applicability; it can be effectively used in organized or unorganized shops. It is a broad, all-inclusive technique for an orderly analysis and evaluation of human work relations. It may be used to inquire into the cause of strikes or into reasons for the absence of corporate loyalty in working groups. It may be used to investigate the causes of labor unrest or to ascertain the causes of wasteful labor turnover, or some friction or specific maladjustment within the organization.

The labor audit, in brief, prepares the way for understanding all the problems involved in setting up and operating the various divisions of a well-rounded personnel program—employment, health and safety, education and training, personnel research, employee service features, and joint relations, or collective bargaining.

Briefly, the essentials to the making of a successful labor audit are:

1. The right attitude on the part of management—an unbiased point of view and sincere determination to find and face the facts.

2. A cooperative attitude on the part of labor—a wholehearted willingness, through their spokesmen, to put all records, relevant facts, opinions, and convictions freely before the auditor.

3. A well-qualified auditor. The labor audit will be no better than the investigator who makes it. He must be something more than a good accountant, endowed with a pleasing personality, a sober, creative imagination, great patience and tact, understanding of and sympathy with people. He should, in fact, possess the qualities of the true teacher, be able to draw people out, make them all feel that they are a vital part of the audit, respect and elicit confidence by being discreet and wise in revealing what he knows.

4. A well-formulated method of conducting the audit, which will insure reaching all vital sources of relevant information. This may include a competent, full-time research assistant working under the direction of the auditor, and it demands continued conference procedure, bringing the executives on different operating levels together with labor representatives.

5. A standard, comprehensive, and logically arranged check list of items to be covered by the audit.

Check List Items

A comprehensive check list will include all important employment problems; terms of employment; health and safety, including preventive medicine; education and training, particularly conferences for top executives; employee services such as food, housing, savings, security, pensions, recreation; research in job analysis, job specifications, time and motion study, rate setting; negotiations and adjustments, chiefly collective agreements with unions arrived at through the conference method; the probing of managerial policies, methods, and opinions; and the chief economic and

* *Personnel Administration: Its Principles and Practice*, McGraw-Hill Book Co., Inc., New York.

on Policies

Dr. Metcalf, in advocating the labor audit, writes from long experience in applying it while serving as industrial relations counselor to Hood Rubber Company, Servel, Inc., Newport News Shipbuilding & Dry Dock Company, and many other concerns. Over a period of years he has organized and conducted management conferences for executives, to which eminent economists, scientists, and industrial leaders have contributed. With Ordway Tead he co-authored Personnel Administration: Its Principles and Practice *and* Labor Relations Under the Recovery Act. *Head of the Department of Economics, Tufts College, from 1909 to 1917, he has also lectured on personnel administration at Columbia and New York University. A Harvard graduate, he earned his Ph.D. at the University of Berlin.*

labor policy beliefs of owners and executives, as expressed through coordination of staff and line departments; and, finally, public relations—relations with stockholders, competitors, employers' associations, trade unions, government and consumers.

Robert G. Valentine's model check list (copyrighted in 1916) comprised 35 cards, each carrying detailed questions with respect to some phase of personnel and the relationship of personnel policies or other management policies. These cards ran the gamut of factors affecting industrial relations from "Physical Working Conditions" through "Work Analysis" and the various personnel procedures, to "Form and Efficiency of Management."

Must Be Comprehensive

To give some idea of the comprehensiveness of a labor audit, I am listing the questions on a few of Valentine's check-list cards, picked at random:

Training—What instruction for: Beginner, in his job? In several processes? School children, pre-vocational? Old employees for promotion? Foremen for teaching employees? Executive positions? Have you a library? Furnish details of its use. Have you a company paper? How is it run?

What regulations, written or unwritten, as to discipline? What procedure as to discharge (detail)? How do employees learn company rules? What is the promotional policy? From inside up? From outside out? Who promotes and on what basis? Do you have a suggestion system? What methods of inspecting work?

Do you have meetings of foremen? Of workers by departments? If so, for what? How often? What committee or other organizations to consider: Working conditions, discipline, promotion, discharge, wages, grievances, suggestions? What are their powers? How are they composed? What is the line of appeal?

Labor Legislation and Court Decisions—What system have you of following labor legislation that affects your business? Do you watch proposed legislation in preparation? Do you take any active part in creating sentiment for progressive industrial legislation? Do you distinguish between advocacy of the principle of new legislation and opposition to impractical details? Do you help to make proposed measures practical and sane? Do you keep in touch with court decisions that directly affect your business? Do you discuss these with your lawyer? How do you keep in touch with court decisions other than those that directly affect your business?

Payment Plans—State weekly wages of employees by groups. State total yearly wages of employees by individuals, with time each worked. Is there dissatisfaction with wages? Give details. How are wages determined? Do you have a stated minimum wage? What is your policy about fines and deductions? Have you any system of supplementary wages? If so, describe. What do you consider a living wage in your city for a man with a wife and three children?

Form and Efficiency of Management in Relation to Labor Problems—How is your purchasing organized? What control of materials and supplies have you? Of volume? Of value? How far have you studied the layout of equipment? Does your equipment include the latest improvements? To what extent is equipment

(Continued on page 114)

Nearest thing in this country to the federations that deal with labor in Britain is the newly organized San Francisco Employers' Council. Left, Roger D. Lapham, a moving spirit in its inception; right, Almon E. Roth, president

Employers Organize for Bargaining

SAN FRANCISCO, famed for its history of ceaseless labor strife, has set the stage for an outstanding new experiment in mass employer-employee relations which may make history of another sort.

In the recently organized San Francisco Employers' Council, the industrialists of the Golden Gate city have molded a collective bargaining unit somewhat parallel to organized labor's lines. The Council knits the employer associations of several industries into a federation neither too loose to be effective nor too compact to hamper action.

Each of the member groups is free to bargain as it pleases in its own field, yet each may call, when necessary, upon the entire Council for support, assistance, information, and advice. Note well that in just those words it would also be possible to describe the relationship of the component parts to the central organizations of AFL and CIO.

Such a structure would serve well if the employers were drawing their lines for a pitched battle with labor. But union-busting has no place in the Council's program. Elsewhere the guerilla warfare characteristic of the Coast proceeds as usual. The San Francisco plan, however, implies full acceptance of unionism as an accomplished fact. This granted, the Council sets out to trade with labor on a business basis. In effect it creates machinery to eliminate friction and inequity from the procedure whereby management purchases its labor supply wholesale from the unions under standard conditions and on standard terms.

Inherent in this set-up is the seed of an employers' unit resembling the federations that deal with labor in England, Sweden, and Norway. Such a course is frankly contemplated by the Council. San Francisco's stormy labor history fits the city uniquely to take America's first step in the English direction. Many of the chief British employer unions of today are the outgrowth of organizations formed originally to fight unionism to the last ditch. Defeated, they remained on the scene and settled down finally to a peaceful, practical relationship.

San Francisco already has advanced several steps ahead of most American cities in the evolution of implements for wholesome industrial relations, says Roger D. Lapham, one of the moving spirits in the Council's inception. Chairman of the American-Hawaiian Steamship Company, Mr. Lapham has long been known as a keen negotiator in labor matters and an advocate of industrial peace.

20 Years' Experience

"The Employers' Council is really the outgrowth of all we have been able to learn in the last twenty years," Mr. Lapham declared when, as chairman of the organization committee, he announced the Council's birth. "It seeks to promote sound industrial relations founded upon a collective employer strength comparable to the collective strength of organized labor. Such relatively equal strengths lead to mutual respect and to the making and keeping of fair working agreements."

Incorporation papers were signed, with little fanfare and no talk whatever of altruistic aims, by 23 leading San Francisco employers. Most of these represented groups already in existence. A few spoke only for their own firms which, presumably, will be the nucleus for new associations to be organized under the Council's banner. Some of the member associations already have city-wide industrial agreements in force. Others will seek a basis for such agreements. To leave the field clear for the new Council, the old Industrial Association of San Francisco has decided to disband. This group, operating with more limited objectives, included a good many of the associations that the Council now embraces.

Nothing in the way of spectacular immediate action is expected of the Council. It has a big job of organizing to do and a long period of preparation ahead of it. Not the least of its first tasks will be the establishment of a research bureau designed to equip negotiating members with facts and figures.

Heading up the actual execution of this program is another noted San Franciscan, Almon E. Roth. He took the reins from Lapham when, upon the completion of the incorporation proceedings, the Council chose him for president. Like Lapham, Roth

(Continued on page 120)

MOTION STUDY RESEARCH

2. How Shape of Pins Affects Bar-Positioning Time

The elements studied here are common to many a production task. Evaluating the effect of various small changes provides basic data from which better methods may be evolved

RALPH M. BARNES
Professor of Industrial Engineering
and
MARVIN E. MUNDEL
Research Assistant in Mechanical Engineering
University of Iowa

OBJECT of this investigation was to determine the effect of changing the shape of the tops of two steel pins on which steel bars with two holes were assembled: *A*, when there was only a small clearance (0.003 inch) between the pin and the hole (analogous to a "go" gage or to fairly accurate assembly work); and *B*, when there was a considerable clearance (0.011 inch) between the pin and the hole (analogous to rough assembly work).

Parts Used—Bars used in both parts of the study were made of cold rolled steel. For part *A* the two holes were drilled and reamed to a diameter of 0.250 inch. Thus the holes were 0.003 inch larger than the diameter of the pins. For part *B* the bars were identical with those used in part *A* except that the holes were drilled and reamed to a diameter of 0.258 inch. Thus in this case the holes were 0.011 inch larger than the diameter of the pins.

Five sets or pairs of pins (Figure 1) were used in the study. Each pair was permanently set in a heavy steel base. The pins were uniform in diameter, cylindrical in shape. The same five pin sets were used in parts *A* and *B* of the study.

Equipment—Much the same apparatus was used in this study as in the one described in January. The workplace was arranged as shown in Figures 2 and 3.

The apparatus consisted of a supply of eight bars which were loosely

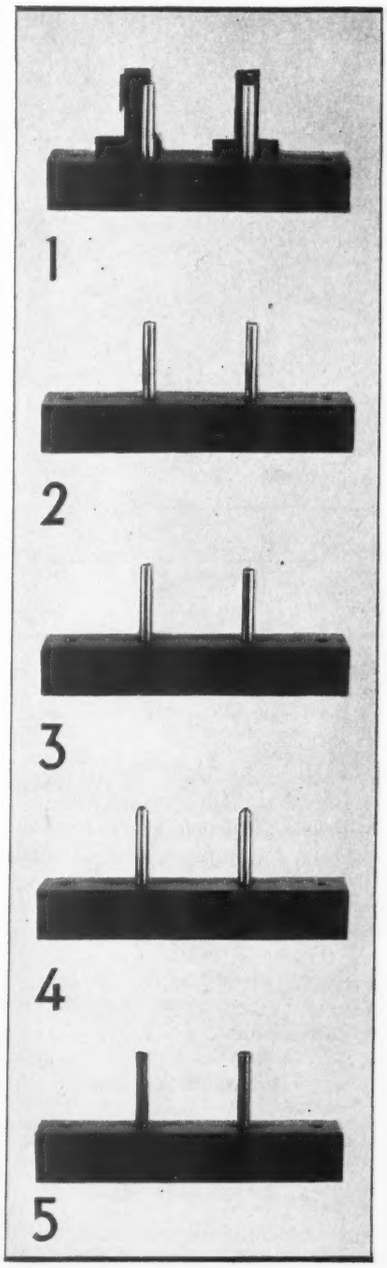


Figure 1. Five pin sets were used: No. 1, smooth pins with square ends and of equal height, with guides at left-hand end and back; No. 2, smooth pins with square ends and of equal height; No. 3, smooth pins with square ends but of unequal height; No. 4, smooth pins with round ends and of equal height; No. 5, threaded pins with square ends and of equal height

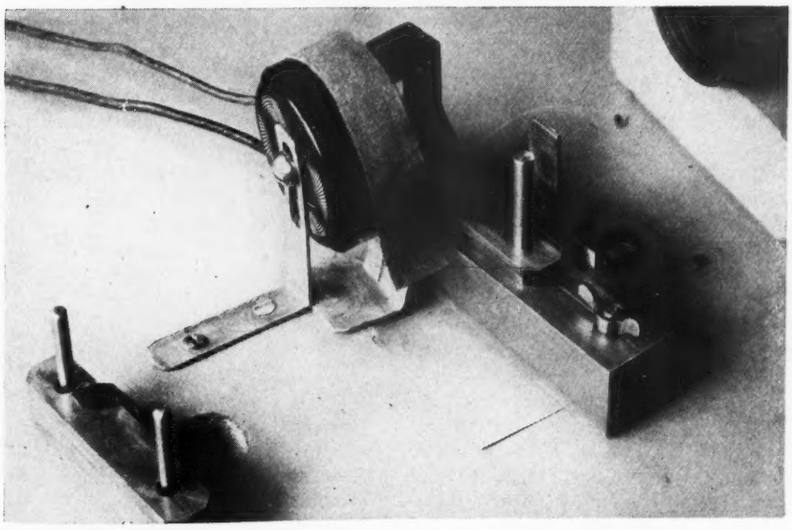


Figure 2. Arrangement of workplace for bar assembly. The operator grasped one bar at a time, lifted it off the thin pins that kept the bars in a stack, carried it to the pin set at the right, and assembled it

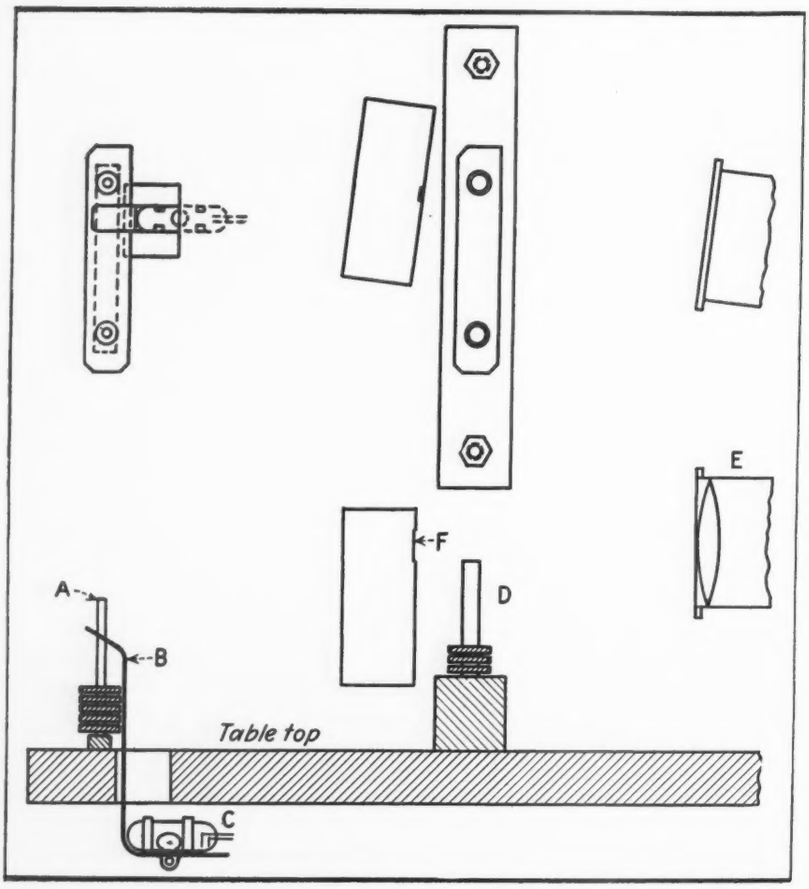


Figure 3. Cross-section of workplace for bar assembly. *A*, pins holding supply of bars; *B*, trip lever connected to mercury switch under table top; *C*, switch; *D*, pin set; *E*, source of light; *F*, slit in cover of photocell

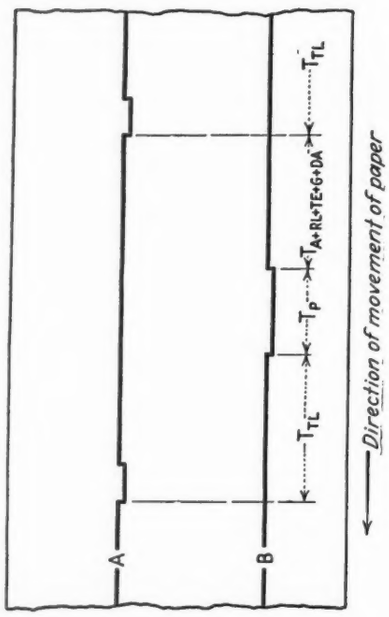


Figure 4. Record made by solenoid-operated pencils on the kymograph

stacked on two pins, 1/8 inch in diameter, at *A* in Figure 3. The lever, *B*, of light construction, was placed near the top and between the two pins. This lever was connected to a mercury switch, *C*, beneath the table. As each bar was removed the lever closed the circuit and moved a solenoid-operated pencil on the kymograph. Line *A* (Figure 4) was made by this solenoid-operated pencil.

A Bar at a Time

The operator carried one bar at a time from *A* (Figure 3) and placed it on the pin set, *D*. As the bar moved down on the top of the pins, it interrupted a beam of light coming from a projector at *E* and falling on a photoelectric cell at *F*. The photocell was connected through relays to a solenoid-operated pencil.

A vertical slit 1/16 inch wide and 1/4 inch long was made in the metal guard which covered the front of the photocell. The position of the light source and the position of the slit were so adjusted that the beam of light was interrupted as the bar came within 1/8 inch of the top of the left pin. This instant was considered as the end of the *transport loaded* therblig and the beginning of the *position* therblig.

The circuit of this solenoid remained closed until the bar was positioned on the pins and until the top surface of the bar came flush with the tops of the pins. The time that this circuit was closed was considered as the length of the *positioning* time. Line *B* in Figure 4 was drawn by a pencil operated by this circuit. T_{TL} on line *B* was a measure of the time to carry the bar from the supply at *A* to the pins at *D*. T_p was a measure of the time to position the bar on the pins and $T_{A+RL+TE+G+DA}$ was a measure of the time to assemble the bar on the pins, release the bar, move the hand back to the supply of bars at *A*, grasp the next bar, and remove it from the small pins. Just as the bar left the pins at *A*, the lever, *B*, tripped the mercury switch, *C*, and marked the beginning of the *transport loaded* therblig.

The sequence of motions for one cycle of the operation, with names of therbligs and the time shown on Figure 4, was as follows:

1. Carry the bar from the supply at *A* to the pin set at *D* in Figure 4—*transport loaded*—T_{TL},
2. Place bar on pin set at *D*—*Position*—T_P,
3. Assemble bar to pin at *D*—*assemble*
4. Let go of bar—*release load*
5. Move hand back to supply of bars at *A*—*transport empty*
6. Grasp bar at *A*—*grasp*
7. Remove bar from thin pins at *A*—*disassemble*

} $T_{A,RL,TE,G,DA}$

Procedure—Ten operators were used on each of the two parts of the study. Each operator was instructed to grasp one bar at a time with his right hand, lift the bar off the thin pins that kept the bars in a stack, carry the bar to the pin set, and assemble it. Operators were further instructed to use the same method of grasping at all times.

Preliminary Practice

The operators practiced 48 assemblies with each of the five pin sets, making 240 assemblies in all, previous to the recording of any data on the kymograph. The operators practiced at pin sets No. 1, 2, 3, 4, and 5 in that order.

After an operator had had this practice, pin set No. 1 was again

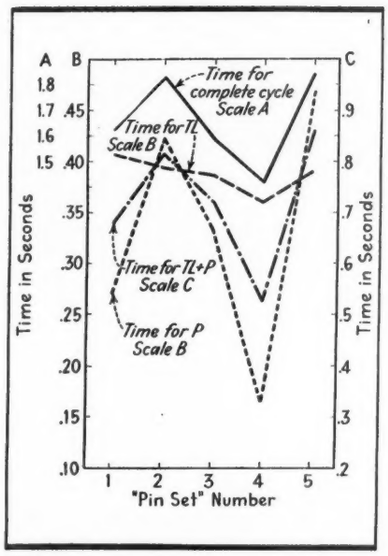


Figure 5. Graphic representation of results when the clearance between the pins and the holes in the bars was 0.003 inch. Curves show averages of median values of ten operators with the five pin sets

placed in position and the operator practiced eight assemblies, doing them as fast as he was able. Time values for the next eight cycles were recorded by the kymograph, these eight cycles also being performed at maximum speed. The same procedure was used with pin sets No. 2, 3, 4, 5, and then again with 5, 4, 3, 2, and 1 in that order. All operators were male college students.

Analysis of Data

Results—In both parts of the study the data for five consecutive cycles for each work spell with each pin set were analyzed. Since the subject proceeded from pin set No. 1 to 5, and then from set No. 5 back to 1, there were ten cycles for each pin set per operator.

In both parts of the experiment, the median values were computed from the ten cycles with each set of pins for each operator because the operators were only partly skilled, and the average values would be influenced more than the median by isolated extremely high or low values. These medians were computed on the basis of the sum of the *transport loaded* and *positioning* times for each cycle. Since there were ten cycles in each set, this necessitated averaging two cycles. The time for the rest of the cycle for both selected cycles was also averaged. It is to be noted that the median was not selected for each therblig individually, but that two selected actual cycles were averaged.

TABLE I — RESULT SHEET

Medians selected by total of time for transport loaded and position for ten operators. The averages of the medians are also shown. The clearance between the pins and the holes in the bar was 0.003 inch.

Time in Thousandths of a Second

Pin Set No.	Operator No.	T_{TL}	T_P	T_{TL+P}	$T_{A+RL+TE+G+DA}$	T*
	1	420	312	732	939	1671
	2	399	138	537	920	1457
	3	320	298	618	924	1542
	4	380	252	632	863	1495
	5	420	279	699	1087	1786
1	6	629	433	1062	1200	2262
	7	392	229	621	775	1396
	8	369	165	534	838	1372
	9	377	179	556	822	1378
	10	366	425	791	1068	1859
	Average	407	271	678	944	1622
	1	399	685	1084	1158	2242
	2	312	162	474	880	1354
	3	358	506	864	1010	1874
	4	322	427	749	931	1680
	5	358	392	750	851	1601
2	6	564	412	976	1639	2615
	7	493	262	755	758	1513
	8	366	435	801	642	1443
	9	404	415	819	1166	1985
	10	360	538	898	1089	1987
	Average	394	423	817	1012	1829
	1	404	462	866	1044	1910
	2	334	258	592	843	1435
	3	325	304	629	779	1408
	4	421	408	829	796	1625
	5	380	344	724	1003	1727
3	6	510	277	787	1094	1881
	7	361	326	687	788	1475
	8	391	362	753	725	1478
	9	396	336	732	704	1436
	10	352	231	583	922	1505
	Average	387	331	718	870	1588
	1	403	240	643	1195	1838
	2	352	34	386	891	1277
	3	307	204	511	764	1275
	4	310	261	571	1250	1821
	5	343	160	503	837	1340
4	6	381	229	610	839	1449
	7	401	115	516	729	1245
	8	366	78	444	678	1122
	9	383	132	515	700	1215
	10	350	199	549	1035	1584
	Average	360	165	525	892	1417
	1	420	591	1011	917	1928
	2	311	173	484	1235	1719
	3	332	552	884	1251	2135
	4	376	562	938	1414	2352
	5	357	472	829	933	1762
5	6	468	608	1076	964	2040
	7	384	347	731	802	1533
	8	406	516	922	746	1668
	9	435	320	755	764	1519
	10	432	572	1004	829	1833
	Average	392	471	863	986	1849

* $T = T_{TL} + T_P + T_{A+RL+TE+G+DA}$

Tables I and II give a summary of these data, and the curves in Figures 5 and 6 show the results graphically.

Conclusions

Part A—Clearance between pins and holes in bars was 0.003 inch.

1. The pin set with the positioning guides (No. 1) produced a cycle 11 per cent faster, a *positioning* time 35 per cent less, and a *transport loaded* time 3 per cent greater than a cycle with identical pins without the guides (No. 2).

2. Lowering the right-hand pin 1/16 inch (No. 3) produced a cycle 13 per cent faster, a *positioning* time 22 per cent less, and a *transport loaded* time 4 per cent less than a cycle with similar pins of equal height (No. 2).

(Continued on next page)

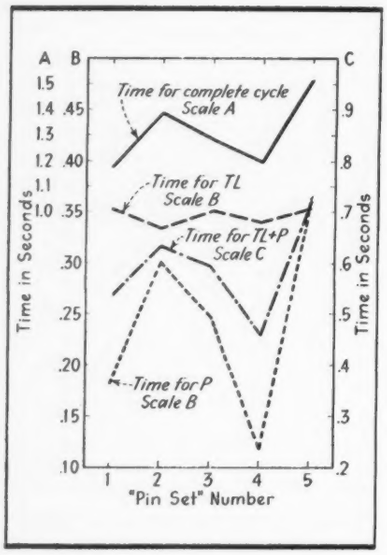


Figure 6. Graphic representation of results when the clearance between the pins and the holes in the bars was 0.011 inch

3. Rounding the tops of the pins (No. 4) produced a cycle 23 per cent faster, a *positioning* time 61 per cent less, and a *transport loaded* time 9 per cent less than a cycle with pins with tops square to the body of the pins (No. 2).

4. Cutting threads on the pins (No. 5) produced a cycle 1 per cent slower, a *positioning* time 11 per cent greater, and a *transport loaded* time 0.5 per cent less than a cycle with pins identical but without the threads (No. 2).

5. Pins with rounded tops (No. 4) resulted in the fastest cycle, the shortest *positioning* time, and the shortest *transport loaded* time.

6. With the exception of the pins with the positioning guides (No. 1), the time for the *transport loaded* tended to vary with the *positioning* time as shown by Figure 5, although no changes were made in the length or manner of this movement.

Part B—Clearance between pins and holes in bars was 0.011 inch.

1. The pins with the positioning guide (No. 1) produced a cycle 15 per cent faster, a *positioning* time 40 per cent less, and a *transport loaded* time 5 per cent greater than a cycle with identical pins without the guide (No. 2).

2. Lowering the right-hand pin 1/16 inch (No. 3) produced a cycle 7 per cent faster, a *positioning* time 18 per cent less, and a *transport loaded* time 5 per cent greater than a cycle with similar pins of equal height (No. 2).

3. Rounding the tops of the pins (No. 4) produced a cycle 14 per cent faster, a *positioning* time 60 per cent less, and a *transport loaded* time 2 per cent greater than a cycle with pins with tops square to the body of the pins (No. 2).

TABLE II — RESULT SHEET

Medians selected by total of time for transport loaded and position for ten operators. The averages of the medians are also shown. The clearance between the pins and the holes in the bar was 0.011 inch.

Time in Thousandths of a Second

Pin Set No.	Operator No.	T_{TL}	T_P	T_{TL+P}	$T_{A+RL+TE+G+DA}$	T*
	1	337	282	619	612	1231
	2	307	319	626	525	1151
	3	349	130	479	707	1186
	4	378	265	643	722	1365
	5	396	104	500	583	1083
1a	6	281	216	497	708	1205
	7	362	109	471	683	1154
	8	351	112	463	597	1060
	9	360	168	528	635	1163
	10	398	109	507	635	1143
	Average	352	181	533	641	1174
	1	355	363	718	700	1418
	2	303	319	622	703	1325
	3	320	284	604	892	1496
	4	374	327	701	1020	1721
	5	332	296	628	624	1252
2a	6	300	243	543	819	1362
	7	352	275	627	694	1321
	8	317	343	660	698	1358
	9	292	407	699	652	1351
	10	395	151	546	717	1263
	Average	334	301	635	752	1387
	1	378	140	518	661	1179
	2	336	335	671	750	1421
	3	278	239	517	469	986
	4	421	395	816	780	1596
	5	330	378	708	684	1392
3a	6	286	206	492	766	1258
	7	374	201	575	672	1247
	8	319	202	521	773	1294
	9	380	221	601	652	1253
	10	407	144	551	704	1255
	Average	351	246	597	691	1288
	1	376	69	445	715	1160
	2	362	158	520	664	1184
	3	318	62	380	710	1090
	4	369	136	505	956	1461
	5	326	182	508	609	1117
4a	6	265	156	421	758	1179
	7	353	144	497	770	1267
	8	332	156	488	738	1226
	9	330	76	406	664	1070
	10	368	53	421	793	1214
	Average	340	119	459	738	1197
	1	438	419	857	708	1565
	2	297	611	908	1093	2001
	3	327	243	570	730	1300
	4	422	298	720	828	1548
	5	367	493	860	657	1517
5a	6	292	396	688	959	1647
	7	389	308	697	773	1470
	8	324	277	601	721	1322
	9	331	469	800	744	1544
	10	358	162	520	731	1251
	Average	354	368	722	794	1516

* $T = T_{TL} + T_P + T_{A+RL+TE+G+DA}$

4. Cutting threads on the pins (No. 5) produced a cycle 9 per cent slower, a *positioning* time 22 per cent greater, and a *transport loaded* time 6 per cent greater than a cycle with pins identical but without the threads (No. 2).

5. The pins with the guides (No. 1) produced the fastest cycle, but this cycle did not have the shortest *positioning* time or the fastest transport loaded. The shortest positioning time occurred when the pins with the rounded tops (No. 4) were used. The shortest *transport loaded* time occurred when the pins with the square tops (No. 2) were used.

[Third in this series of motion study researches by Professor Barnes and Mr. Mundel is scheduled for May publication.—EDITOR.]

Quick Ways to Profits

OPERATING SHORTS FOR OPERATING MEN

MATERIALS HANDLING

Double Crossover Keeps Two Hoists Going

FRANK ELLWOOD, *Chicago*

Crossover monorail tracks that allow floor-operated hoists to cross from one bridge and bay to a parallel bay, and thus increase the floor area served, are fairly common. When both bays are served by individual hoists and bridges, crossing over puts both hoists on the same bridge, and ties up one hoist and its operators.

As a result, usual practice in such cases is to deposit the load under the crossover and have the other hoist pick it up and handle it in the parallel bay. Where loads are handled by chains, special grabs, or lifters for sheet metal, unloading and reloading occupy considerable time.

This problem was solved in a steel warehouse by using two crossover connections between adjacent bays. These crossovers are spaced 10 feet apart, so that use of one does not interfere with the other. Both bays are used for the assembly of orders for truck shipment. Actual transfer to the truck, or unloading, is handled on one line only, and the floor space served by that line must be kept partially clear for receiving; therefore, the adjacent bay is used for most of the temporary storage. Material for shipment is placed in this storage area either by hoists, by gas-powered lift trucks, or on wheeled trucks with the gas-powered trucks serving as tractors.

When shipments are slow, one hoist is placed on the crossover and the other hoist operates over the two bridges in the two bays. In one bay the loads are picked up, and in the other are set in trucks.

To speed up the work, both hoists and bridges are put in service by calling helpers from the floor, the two bridges transferring, or trading, loaded and empty hoists on the two crossovers.

Put hot materials, such as ashes, in metal containers. If placed in wooden barrels, they may burn a hole through at the bottom, leaving a perfect draft. In metal containers air can only get in from the top, so that fires, if started, may burn themselves out.

Delivery Chute Simplifies Handling of Wire on Reels

A. R. DAHLSTROM, *Brockton, Mass.*

Several tons of wire wound on 50-lb. spools are received daily in our plant. We used to back up the truck to the receiving door, roll the spools to the rear of the truck, lift them to the floor, check them, pile them onto a lift truck, and then transport them through narrow aisles to the machine which processes the wire. Several trips were required to deliver all of the wire.

To simplify and speed up the handling and delivery of wire we built a permanent chute of 2-in. boards, passing through a window and extending from the fence at the street to a point directly beside the wire-processing machine. In this way all intra-plant handling has been eliminated.

When the delivery truck has been spotted alongside the fence, close to the chute, the driver merely places the spools on the chute and lets gravity do the rest. Two leaves from an automobile spring, mounted on the chute, serve to stop the rolling spools at the end of the travel. There a clerk checks the spools quickly as he removes them from the chute and piles them on the floor a few feet away from the machine.

This arrangement has worked so well that plans have been drawn for a similar chute to handle 70-lb. bags of castings.

We realize, of course, that this method of handling can best be applied where the incoming material does not have to go through a testing or inspection department.

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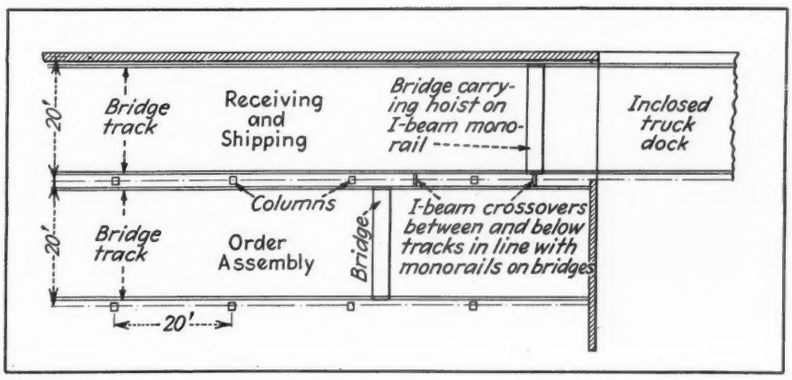
Support for Shaft or Rod

SOURCE
Textile World

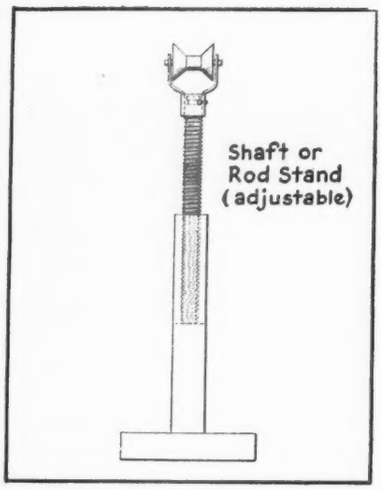
Many times the machine or mechanical shop is swamped with jobs, and every department is pushing it for completion of work. At such times, it is not always convenient to have an extra man available to aid machinists in changing the position of a shaft, rod, or casting when working them in the milling machines, key-way cutter, gear cutter, press, or mechanical hacksaw.

A useful helper then is a device or support, such as is shown in the



accompanying sketch. The swivel pulley is mounted on a column threaded similarly to an automobile jack. This support is designed to be adjustable to the height desired, thus placing the supported end of the material in such a position that accurate workmanship can be performed.

It allows leveling necessary for cutting correct depths of key-seats and splines, properly spaced gears when cut after being placed on the shaft, and other such items that demand perfection or precision of work. Also, having this pulley or whirl in the swivel of the top of the stand will allow moving the part being worked without calling a man off some other job to give extra help.



BUILDINGS AND SERVICES

Hang It—from Ceiling Sockets

SOURCE
Baldwin Piano Company, Cincinnati

Great convenience and economies have resulted at this plant from a facility provided at the time the building was erected. Sockets for sprinkler pipe hangers, consisting of slotted cast iron plates with slot larger at one end than the other, were provided in the ceilings throughout the building. Additional sockets were placed everywhere on 4-foot centers. Total cost was negligible, for the sockets themselves were inexpensive, and the labor of placing them before the ceilings were poured was very slight indeed.

Even since then—and the building is 17 years old—it has been possible to suspend anything we wanted supported from overhead from these sockets, without any drilling or other effort. All that is necessary is a bolt, or threaded bar with a nut, small enough to go through the large end of the socket and too large to pass through the narrower part of the slot. Then a locknut is screwed up tight against the socket plate from beneath, making an absolutely firm fastening.

No matter what needs to be suspended from the ceiling, the sockets take care of it. Theoretically, something too heavy might be required, but it never has been. Where shelves are needed at a point not directly beneath a row of sockets, this is easily taken care of by bending the hanger rods and suspending them from two parallel socket rows. If a greater than ordinary weight is involved, the load may be spread by running hanger rods to a larger number of sockets.

Experience here warrants the recommendation that such sockets be included in any new building, since the original slight cost is repaid many times over in the first five years.

Equipment of all sorts can be suspended from ceiling sockets in any location

Carpenters' horses can be easily made from seven pieces of scrap angle iron, welded together. Four pieces go for the legs, one for the crosspiece, two for leg reinforcements.

Water Line Shut Off by Freezing

NORMAN C. MULLER, *Oberlin, Ohio*

Some years ago we were faced with the necessity of cutting water lines that could not be shut off. The problem sounds difficult, but actually it was solved in a very simple manner, at trifling cost.

We cracked up ice and salt and placed a mixture of the two in bags around these pipes until an ice plug was formed inside the pipe. Then we cut the line, threaded it, screwed on a valve, and let the ice melt.

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Changed Typewriters and Saved

JOHN F. PIERCE
Director, Office Service Department
Tennessee Valley Authority

Printing our organizational telephone directory used to cost more than it does today—all because it was prepared on a pica typewriter. The sheets then had to be photographed and reduced in size.

All we had to do, in order to save this reducing operation, was shift to a typewriter with elite double-gothic modified type. The carriage of this machine moves only one-fourteenth of an inch when a type key is struck, hence gives fourteen letters to the inch, as contrasted with the pica (10 letters) and the elite (12 letters). This typewriter also types eight lines to the inch instead of six.

Electric Heater Keeps Grinding Compound Warm

H. W. BOHNE, *Jackson, Mich.*

Much trouble was formerly experienced during cold weather in keeping the close limits required on plug gages produced on one of our grinding machines.

To overcome this difficulty I installed a 1,000-watt immersion heater and temperature control in the compound tank, with a relay and light on one side of the grinder.

It used to take almost two hours every morning to bring the compound up to room temperature. Now the heater is left on all the time in cold weather and that trouble is over.

During the two years that this heater and control have been in service we have had no trouble with it, nor has there been any need of maintenance.

•

Photographs Amplify Records of Special Models

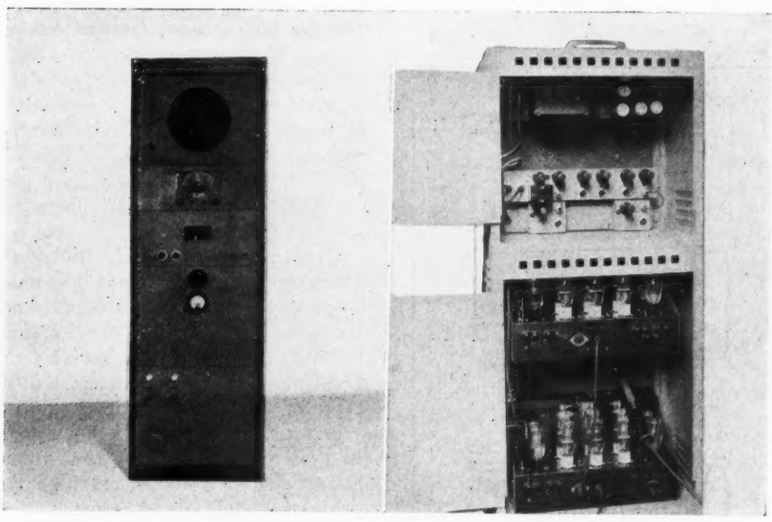
N. F. MANICARDI, *Plant Superintendent Transformer Corporation of America New York*

Like most plants we maintain complete records and specifications on all regular stock items. However, we manufacture on order special electronic devices that incorporate unusual features and specifications. These special units often involve as much engineering and experimenting as the development of stock units. It is not always practicable to make up records of the design until the unit has been completed. About that time the delivery date approaches and the regular records must be discarded.

Some records of such units must be kept and yet the factors of time and expense must be met. Part of the solution to the problem is the use of photography.

This is where our camera enthusiast enters the picture. He records many of the particular details of layout and design with his camera. When that long-promised repeat order comes these pictures will save much guesswork. Such pictures can also be used to demonstrate to customers the type of work done.

The use of a white sheet as a background will furnish an excellent contrast to most items.



Photographs record the designs of units made on special orders

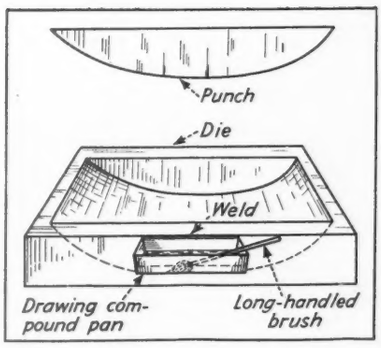
Replacement of cast iron beater shaft, badly worn at the packing gland, was going to cost $620. Instead, the old shaft was reclaimed by bronze welding—for $50.

Pan for Drawing Compound Is Welded to Die

R. A. SHAW

Murray Corporation of America, Detroit

Drawing operations to form steel automobile tops require the application of drawing compounds. These compounds are soapy and rather hard to apply quickly and evenly over the steel sheet.



Our remedy consists of sheet metal pans 8 in. wide, 8 in. deep, and 24 in. long, welded to each side of the die. The operators on each side of the press apply the compound with long-handled brushes which are round and rather closely bound at the bottom. By using these brushes to apply the compound to the steel sheet, less of the compound is wasted than formerly, and operators' arms are kept out of the die and a hazard is thus eliminated.

•

Auto Engines Run for Their Exhaust Gases

SOURCE

Ford Motor Company, Dearborn, Mich.

Among the more unusual tasks performed by automobile engines should be included that of four Ford V-8's in the Ford Motor Company's new tire plant. The engines are operated for the exhaust gas they produce, and the power they make in the process is utilized to compress the gas.

This gas is needed in the tire-curing process. In this process, the tire, with a heavy rubber tube or curing bag inside, is placed in a mold and subjected to heat and pressure. This forms the tread and makes the tire tough and durable. Formerly, steam was shot into the curing bag under high pressure; then it was drawn off and replaced by compressed air. The method was successful, but there was one drawback—because of the great heat and pressure oxygen in the air caused the rubber curing bags to deteriorate too rapidly.

Engineers decided that use of an inert gas, one containing no oxygen, instead of compressed air, would solve this problem. However, to buy enough inert gas for a busy tire plant would be expensive. So they decided to make the gas with V-8 engines, the engines, at the same time, driving compressors to put the gas under the high pressure required.

Running at a fixed speed, the four

engines on the job produce about 14,500 cu. ft. of exhaust gas an hour, which is precisely the amount the four compressors are able to handle. The exhaust gas is piped from the engines through a series of cleaning and filtering devices, and then goes into the compressors as harmless carbon dioxide and nitrogen. The compressors raise the pressure to 450 lb. per sq. in., and send the gas on to the curing molds.

Efficient safeguards are built into the system. One of these prevents impure gas from entering the system. If a fouled sparkplug or some other condition should cause one of the engines to produce exhaust gas too impure for the apparatus to refine properly, this device promptly operates a cutoff valve which lets gas from that engine escape outside the building.

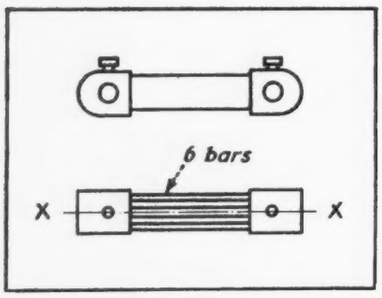
Special ventilation is provided for the room in which the engines operate, and care is taken to see that no gas gets out of the system. If a leak should occur despite these precautions, a sensitive carbon monoxide detector is permanently on guard. This device, installed in the center of the room, can detect extremely minute quantities of that gas. Should it discover a trace of the gas in the air, the device would cause red lights to flash and gongs to ring, both inside and outside the room, so that the attendants could find and repair the leak before it caused trouble.

POWER AND LIGHT

Cut Shunt in Two in an Emergency

ED SWAN, *Kearney, Neb.*

Here is a little shunt that I used one time in an emergency. I had need of a shunt for two ammeters of 250-amp. rating, and had a shunt for



a 500-amp. meter. While trying to think where I could get a shunt of the right size, it occurred to me that I might cut the shunt in two, making two 250-amp. shunts. The shunt had six alloy bars which I cut along the line X-X. Then I calibrated the segments with another meter, making saw cuts in the alloy bars to increase resistance to the proper value. This made a satisfactory shunt for each meter.

•

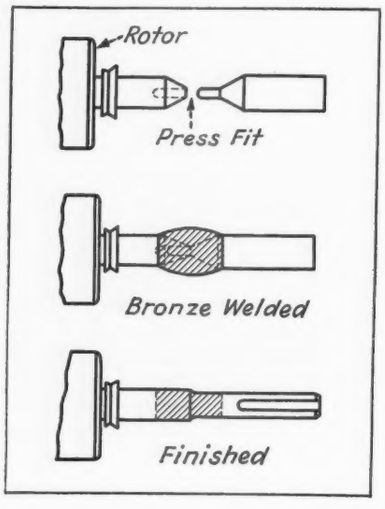
Motor Shafts Extended by Bronze Welding

SOURCE
Linde Air Products Company
New York

The extension of small electric motor shafts without removing the rotor is an operation that is frequently desired. A service shop that has been doing this type of work for several years has developed a particularly satisfactory method based on the use of bronze welding.

Most motors run in bronze bearings, and it is normally not good practice to run moving parts in bearings of the same metal. It has been found, however, that bronze welding rod is suited to the job. The deposited bronze makes a perfect joint and is hard and tough enough to wear well against either bushing bronze or the so-called pot-metal alloys. In addition, the welding rod can be applied at a temperature low enough to prevent scaling.

The accompanying sketches clearly illustrate the method used for extending the motor shafts. The end of the shaft to be lengthened is first tapered and drilled just large enough to take a small pilot. A piece of cold-rolled steel $\frac{1}{16}$ to $\frac{1}{8}$ in. larger in diameter than the desired finished size is then



turned on one end and pressed into the shaft. This serves to line up the work which is now ready to be welded.

The shaft is chucked and trued with an indicator or tied back on the center, the welded end being run in the steady rest just back of the weld. Bronze welding rod is then applied. After welding, it has been found advisable to release whatever stresses may exist by first taking a roughing cut over the joint, then recentering and refinishing.

The cost of this method is about one-third to one-half of what it would ordinarily cost to machine and install a new shaft.

•

Play Safe When Operating Disconnect Switches

S. H. COLEMAN, *Roanoke, Va.*

Disconnect switches usually isolate oil circuit breakers on individual circuits from the main distribution feeders. They are not designed to be opened under load; therefore, great care must be taken to prevent their being operated while the circuit breaker is closed. Failure to observe this precaution may result in the destruction of the switch, injury to the operator, or unbalancing of the system where single-phase disconnects are used on individual lines of polyphase circuits.

If there are no interlocks between breakers and disconnects, warning signs should be prominently displayed. In one large plant signs having "Is the Circuit Breaker Open?" painted in red letters on a white background are placed directly under the switches and beside the rack holding the operating poles.

In another plant auxiliary switches on the circuit breakers control indicating lamps at each set of disconnects. When the breaker is closed the lamp circuit is broken: when the breaker is open the lamp is lighted. If one of these lamps burns out the operator must first check the breaker position, then install a new lamp and see that it is burning before operating the disconnect switch.

To avoid serious shocks the hook sticks for disconnect switches must be protected from moisture and dust. Dampness can be kept out by shellacking the poles at least once a year. If the atmosphere contains much dust, keep the sticks in a dustproof cabinet.

Before using hook sticks they should be carefully inspected and wiped clean. Where voltages are high the operator should wear rubber gloves and stand on an insulating mat.

PUBLIC RELATIONS: *Industry's Biggest Job*

CHARLES R. HOOK

M. H. KARKER

HENRY L. NUNN

Homes for Armco's "60 Families"

MIDDLETOWN, OHIO—Employees of the American Rolling Mill Company will erect a garden village of steel homes, known as Fertile Valley Homesteads.

Each home will be situated on an acre of fertile land. There will be 60 homesteads in the tract. Total cost, approximately $300,000.

The houses were designed for rural living under the supervision of the Committee on Small Dwellings of the Institute of American Architects. Of self-framing, fire-safe steel construction, each will be insulated and weatherstripped, and have a modern bathroom, electricity, furnace, and basement, including a cold cellar for storing fruits and vegetables.

Six floor plans are available. All are one-story houses, but vary in size and architecture. Prices range from $4,500 for a 2-bedroom house, including garage and laundry service room, to $5,300 for one containing three bedrooms.

The plan for financing the homesteads is simple. The 60 employees who will purchase them are going into the building business. A building company is being organized. Only purchasers of homesteads can be common stockholders.

The building company will buy the land and arrange with contractors to erect the houses and build the street, water, and sewage systems under competitive bids. When the village is completed, the company will be dissolved and the stockholders paid book value for their stock including all profits made. Each purchaser can then use the profit he receives to make part of his down payment when he applies for an FHA loan on his home.

"Our company," says Charles R. Hook, Armco president, "has realized for years that good homes mean good citizens who take pride in their work and are a real asset to the community. We have observed that when men live in the country they are far more secure and independent, and are not so seriously affected by the peaks and valleys of business. Moreover, they can give their families more of the comforts and conveniences of life over a period of time."

[Mr. Hook's views on employer-employee relations may be found in "Tell the Employee and Tell Him Why," October, 1936. For a complete outline of Armco policy see the Plant Operation Library Section for May, 1937.]

✦

Jewel Tea Employees Build Retirement Estates

BARRINGTON, ILL. — Profit sharing and savings are tied together in a plan that gives Jewel Tea employees an opportunity to build retirement estates.

Employees may deposit from $1 to $4 a week. Each year the company will pay into the fund 25 per cent of net profits in excess of cumulative earnings of $3 per share on 280,000 shares of common stock. To start the plan off, the company has already contributed $80,555.90.

Both employee deposits and company contributions will be placed in a trust fund for safekeeping and investment. The fund will be administered by the Continental Illinois National Bank & Trust Company of Chicago (third largest bank in U.S.) and two individual trustees. Once the funds are placed in trust they can never be returned to the company, and the employee's share may be withdrawn only on retirement, separation from service, death, or permanent disability.

The company's contribution will be divided proportionately in two ways among employees who participate:

1. One half on the basis of the employee's earnings in relationship to the total earnings of the other employees in the plan. Only earnings during the weeks of deposit will be included.
2. The other half on the basis of the

(Continued on page 132)

✦

Nunn-Bush Employees Elect Two to Board of Directors

MILWAUKEE—Approved at the Nunn-Bush stockholders' meeting in January was President Henry L. Nunn's proposal that employees elect two of their number to the board of directors—one from the production force and one from the retail division.

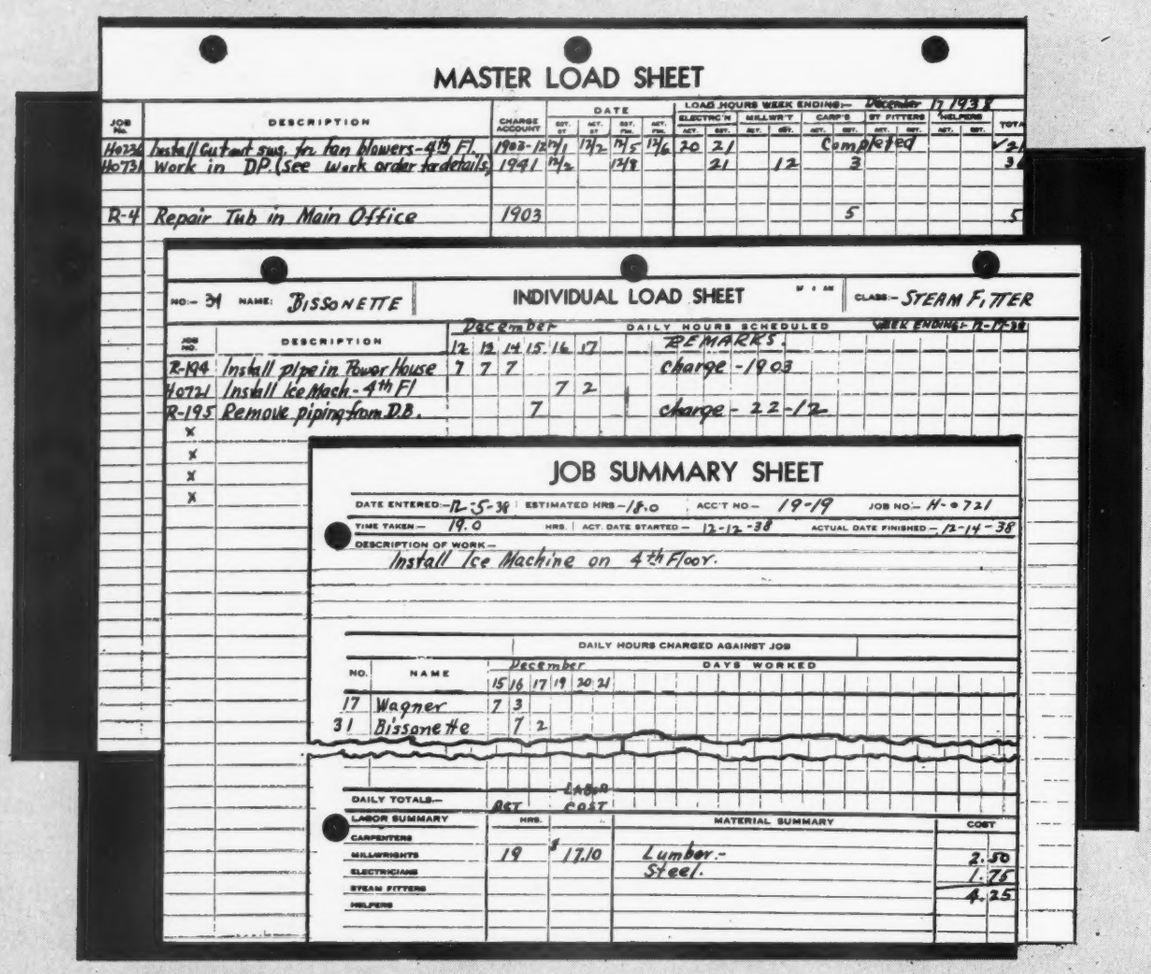
Said Mr. Nunn in his announcement of this pioneering step in labor relations:

"It is our belief that the most successful industries of the future will give an increasing interest and study to all the human elements in business, to that part that supplies the necessary labor as well as that part that supplies the necessary capital . . .

"The management is also confident that through this closer official association of all the essential elements of our business will come a still greater appreciation by workers of the problems of management and a more constructive cooperation which will redound to the greater good of all."

[The Nunn-Bush Shoe Company is well known to FACTORY readers for its 52-Pay Checks Plan by which some 1,300 employees have received a pay check each week for the past 3½ years. See "A Pay Check Every Week," August, 1935; "26 Pay Checks Later," March, 1936.]

DAILY SCHEDULES BAR



MASTER LOAD SHEET

JOB No.	DESCRIPTION	CHARGE ACCOUNT	DATE EST. ST.	DATE ACT. ST.	DATE EST. FIN.	DATE ACT. FIN.	LOAD HOURS WEEK ENDING:— December 17 1938 ELECTRIC'N ACT.	ELECTRIC'N EST.	MILLWR'T ACT.	MILLWR'T EST.	CARP'S ACT.	CARP'S EST.	ST. FITTERS ACT.	ST. FITTERS EST.	HELPERS ACT.	HELPERS EST.	TOTAL
H0736	Install Cut-out sws. for fan blowers-4th Fl.	1903-12	12/1	12/2	12/5	12/6	20	21			Completed						21
H0731	Work in DP. (See work order for details)	1941	12/2		12/8			21		12		3					36
R-4	Repair Tub in Main Office	1903										5					5

INDIVIDUAL LOAD SHEET

NO:— 31 NAME: BISSONETTE CLASS:— STEAM FITTER

JOB NO.	DESCRIPTION	December 12	13	14	15	16	17	REMARKS
R-194	Install pipe in Power House	7	7	7				charge - 1903
H0721	Install ice Mach - 4th Fl					7	2	
R-195	Remove piping from DB.				7			charge - 22-12
X								
X								
X								
X								

JOB SUMMARY SHEET

DATE ENTERED:—12-5-38 ESTIMATED HRS—18.0 ACC'T NO.— 19-19 JOB NO:— H-0721

TIME TAKEN— 19.0 HRS. ACT. DATE STARTED— 12-12-38 ACTUAL DATE FINISHED— 12-14-38

DESCRIPTION OF WORK—
Install Ice Machine on 4th Floor.

DAILY HOURS CHARGED AGAINST JOB

NO.	NAME	December DAYS WORKED 15	16	17	19	20	21
17	Wagner	7	3				
31	Bissonette		7	2			

DAILY TOTALS— LABOR SUMMARY	ACT. HRS.	LABOR COST	MATERIAL SUMMARY	COST
CARPENTERS				
MILLWRIGHTS	19	$17.10	Lumber -	2.50
ELECTRICIANS			Steel.	1.75
STEAM FITTERS				4.25
HELPERS				

Master Load Sheet shows weekly load ahead of each type of maintenance labor; Individual Load Sheet, jobs ahead for each man; Job Summary Sheet, actual time spent on the job

Works engineer and maintenance foreman sit down each day and plan each man's work for the next day. Three records are kept; they are a big help in maintaining close control

T. C. McMAHON

Factory Manager, Square D Company, Detroit

A DAILY SCHEDULE developed to control maintenance labor has greatly improved the performance of this department and has eliminated idle time spent in waiting for job assignments. In addition, by accumulating a weekly load schedule for the various classes of maintenance labor, we are able to plan ahead for the proper distribution of man power.

General maintenance and upkeep of the factory is under the direction of the works engineer, who supervises the power plant as well, and has a force of 28 men and women. Under normal conditions the plant employs between 800 and 900 people, engaged in making a wide variety of electrical switches and control apparatus.

Many functions asssigned to the works engineer have employees definitely assigned to them; for example, engineers, firemen, elevator operators, sweepers, oilers, watchmen, and janitors. Electricians, millwrights, carpenters and steam fitters, and unskilled workers, while fixed as to these various classifications, work on a great variety of jobs.

It is these types of work that are scheduled. Furthermore, from the schedule it is possible to tell the jobs upon which each man has worked, the hours devoted to each job, and the total hours expended each week for each class of labor.

Initial step is the repair requisition which may come from any department in the plant. One copy goes to the maintenance foreman and the second to the stockroom. A verbal request may serve the same purpose. In any case, an estimate is made by the works engineer as to the amount of labor and material required. For new work, or extensions, the estimate may be made from the layout drawing of the work.

A work order for jobs estimated to

IDLE MAINTENANCE TIME

cost over $10 is written from the repair requisition, and contains a description of the work to be done and a statement of the material needed. If material not carried in stock is required, a purchase requisition is immediately prepared. Jobs involving more than $10 expenditure are approved by the factory manager. Included as a part of the job write-up is the assignment of the account number to which the cost department is to charge all labor and material for the job. Jobs estimated to cost less than $10 are scheduled from the repair requisition.

Each department or class of labor in the works engineering department concerned in the job is given a copy of the work order. Copies go also to the cost and accounting departments.

Now begins the real work of scheduling. A "Job Summary Sheet" is filled out, with a description of the work as recorded on the work order or requisition, together with the estimated hours required. This is filed and serves as an accumulator of the hours spent on the job by the various kinds of maintenance labor.

At the same time, the "Master Load Sheet" is also filled in. This is a summary, divided by classes of labor, of all jobs ahead of the department. As such it gives the hours ahead of the electricians, for example, and if the hours are greater than the available man-hours, provision may be made for increasing the staff, should the urgency of the work demand it.

A third form made out from the work order is the "Individual Load Sheet." This assigns each job to a particular employee for each day.

The Job Summary Sheet to which the hours spent daily by each class of labor are posted, permits a constant check against the original estimate.

Daily, the maintenance foreman and the works engineer meet and go over the performance of the department for the current day and then decide what each man shall do for the day following. New jobs to be done are added to the list at this time, and assigned to millwrights, electricians, and so forth, depending upon the type of work to be done and the unfinished load ahead of each man. At the same time, the hours spent by each man on each work order or repair requisition are posted to the job summary sheet as previously noted.

At the end of the week, the hours recorded as worked against each job on the Job Summary Sheet are transferred to the Master Load Sheet. This is done by crossing out the hours recorded under each class of maintenance labor and writing in the difference between the hours worked and the original estimate. This sheet then shows at all times the estimated hours yet to be spent on each job.

For convenience, a new Master Load Sheet is made out for each week, containing this revised information. Jobs completed during any week are closed out, of course, and are not transferred.

Good order evident in this regulator and pressure switch assembly department testifies to effectiveness of maintenance scheduling

About the Author

Practically all Mr. McMahon's industrial life has been spent with Square D, where he came in 1916 from Packard Motor Car Company. He moved from foreman of the shipping department to supervisor of stores and scheduling to production manager. Then in 1920 it was decided that he should be purchasing agent, and in 1928, assistant factory manager. Promotion to factory manager came in 1930, and since 1936 he has assumed the additional duties of factory manager of Square D's Porcelain and Bakelite Division at Peru, Ind.

Each day the foreman submits to the cost department a sheet showing the hours spent by each man against each work order or account number. This is the basic cost record for maintenance labor. It is made out from the individual load sheets.

Saves Clerical Work

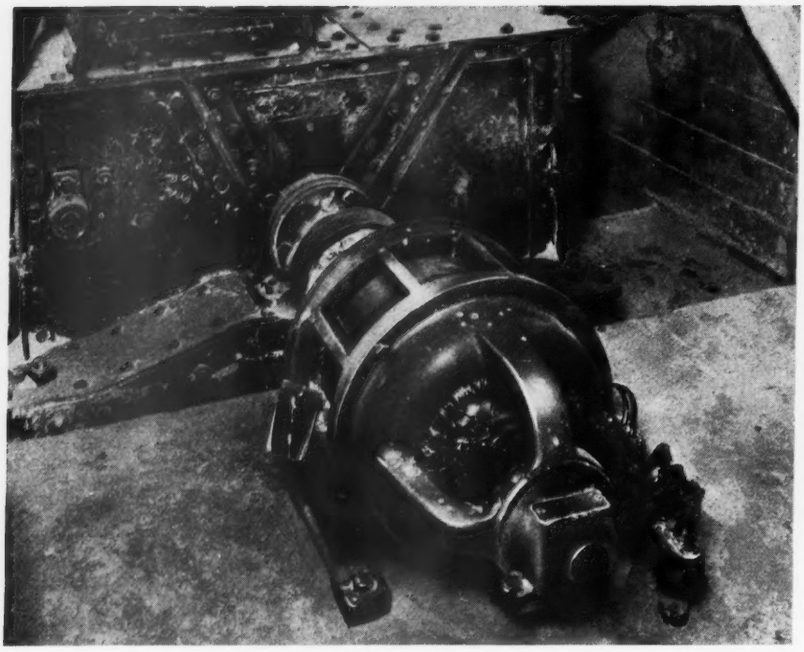
Job tickets, which would record the time each worker spent on each job, have not been found necessary in the internal operation of the department. With the individual load sheets, experience has shown that further elaboration is not needed, which means a large saving in clerical detail.

It cannot be emphasized too strongly that, from a control standpoint, an accounting classification must be developed so that all types of maintenance work may be assigned to the proper categories, if correct costing is to result.

The maintenance foreman returns to his department from the daily conference with the works engineer with his load sheets, one for each man, indicating the next day's assignments. But the best-laid plans sometimes go astray. A belt may break, or a conveyor may have to be repaired at once to avoid stopping production.

The foreman then takes some of his men away from less urgent jobs and assigns them to the new task. At the same time, he revises the hours indicated on the load sheet, and writes in the new work to which the men are assigned, indicating the correct accounting classifications. This is not difficult to do as all general maintenance work is assigned to one account number, whether it be patching the

(Continued on page 120)



This motor is in a damp place. To avoid any question, the date of each inspection, and any repairs made, are recorded in the log book attached to the frame

For Motors That Run Where It's Wet

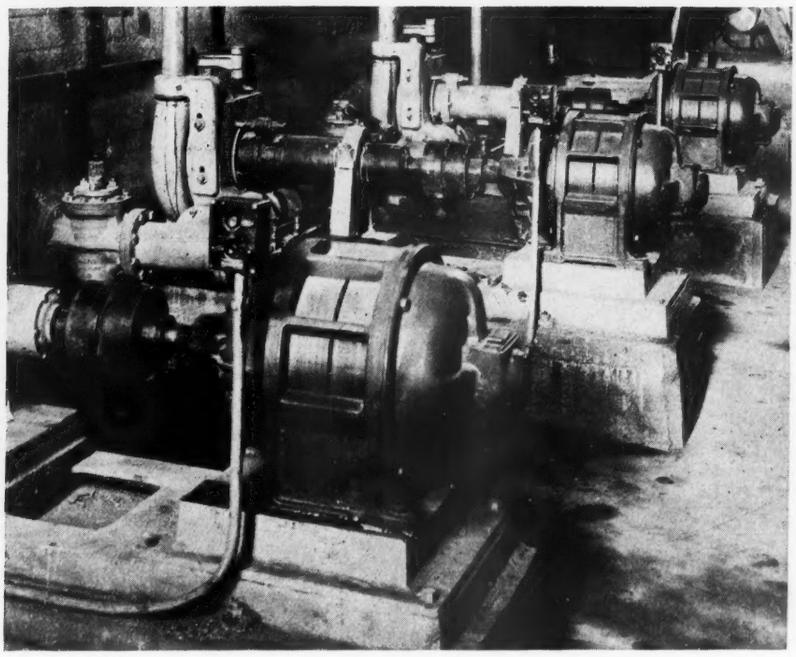
H. C. Ritchie hails from New Glasgow, Nova Scotia. His industrial experience began in the electrical department of Nova Scotia Steel & Coal Company. Some time after joining General Electric Company in 1906, he was assigned to the Searchlight Engineering Department. Here he engineered lighting installations for flying fields and worked on the development of the first airmail beacons used by the Post Office Department for night flying. Later he was transferred to the Industrial Department, where of recent years he has been conducting surveys on the use of electric power.

THOSE RESPONSIBLE for electrical equipment are frequently confronted with the problem of keeping in proper condition a motor, control, or machine that is operating in a very unfavorable location. This location may be a damp cellar, a closed-in space over a boiler room, or a platform where rain or snow occasionally drenches the motor and sometimes the control apparatus.

The solution that first comes to mind is to substitute a splash-proof or totally inclosed motor with weather-proof control. In this way the expense of continued maintenance and repair can usually be saved.

On the other hand, the equipment may be used only occasionally, or conditions may become really bad only once in a while, so that the purchase of a new motor does not seem justifiable. The problem then is to take care of existing equipment and prevent its being damaged.

Good insulating materials, well designed and applied, are used in the products of all reputable electrical manufacturers. If this insulation were not much better than the minimum required for standard jobs, the equipment would not stand up for any length of time. Dampness or excessive temperature and humidity will, in time, deteriorate the insula-



Driving slurry pumps in a cement mill, these motors are exposed to water drip from piping and dampness in the floor and walls. For better protection the control panel is located in the cabinet at the rear

H. C. RITCHIE

Industrial Department, General Electric Company, Schenectady, N. Y.

tion of motor windings. Grounds or short circuits will occur, and the motor must be rewound. Particular care must be given, therefore, to the frequent inspection and care of all equipment that operates under unusual atmospheric conditions. Cents spent here will save dollars in sustained production.

Make inspections regularly and often. The frequency of inspection will vary with the conditions. Once a week may be often enough under some conditions, whereas in other places a daily inspection may be required. The main requirement is that inspections be made regularly on schedule so that the out-of-way motor and control equipment will not be overlooked.

It will generally be found more profitable to inspect the equipment when it has not been in use for some time. A motor in operation will soon dry itself out, if it is not being drenched with water. An idle motor, however, will collect moisture, especially in inaccessible places, and deterioration will be started.

Protect electrical equipment with covers of wood, metal, or cloth when not in use, but make them readily removable for inspection and repair. Moisture will collect inside a cover and stay there unless removed.

A good idea of the general condition of electrical equipment can be obtained during routine inspections and tests, or while making repairs, by measuring the insulation resistance. Readings can be taken by the voltmeter method or by means of an insulation-resistance meter. The latter is recommended because it is a self-contained, direct-reading unit which is easy to use. Potential for making the test is usually supplied by a hand-driven generator. Readings are in megohms.

It is advisable to plot the results of successive readings from a piece of equipment and watch the shape of the curve over a period of time. It is then comparatively easy to tell whether the insulation of a motor, say, is keeping in good condition, or is gradually deteriorating.

When a motor or other item of equipment is being dried out, readings of the insulation resistance will indicate the progress of the operation and tell when it is completed. Tests should be made at regular intervals and the results plotted. When the curve flattens out and indicates a comparatively constant value, it may be assumed that little or no improvement can be made by further drying.

An erratic curve indicates some such condition as stray leakage paths to ground, creepage over the surface of the insulation, corroded terminals, or burned or weak spots in the insulation.

When high-potential tests are made, readings of the insulation resistance should always precede as well as follow them. In this way it can be determined whether the insulation is ready for a high-potential test, while the final check on insulation resistance will show whether any weakness has developed during the high-potential test.

Incidentally, it is well to bear in mind that while the high-potential test for new motors and generators involves the application of at least twice the rated voltage plus 1,000 volts, machines that have been in service for any length of time should not be subjected to such high voltages; 150 per cent of rated voltage is usually sufficient.

Insulation material used in standard motors is not so resistant to excessive moisture as that used on motors especially designed for operation in damp places. However, this deficiency can be overcome in part by revarnishing the coils and leads of motors used in places that are occasionally damp.

Be Sure of the Varnish

If inspection shows moisture on the coils, the motor should be thoroughly dried and a high-grade insulating varnish applied to all exposed coils and leads. Many electrical manufacturers make their own varnishes, or purchase them on strict specifications, and are able to supply the proper grade for any electrical use. Their recommendations should be followed.

If a motor has been flooded with water, it should be thoroughly dried out before it is again placed in operation. Smaller motors can be placed directly in an oven, keeping the temperature low enough to prevent damage. A temperature of 90 deg. C. (194 deg. F.) is safe for all classes of insulation, and with sufficient time will do a good drying job.

If the motor is too large for con-

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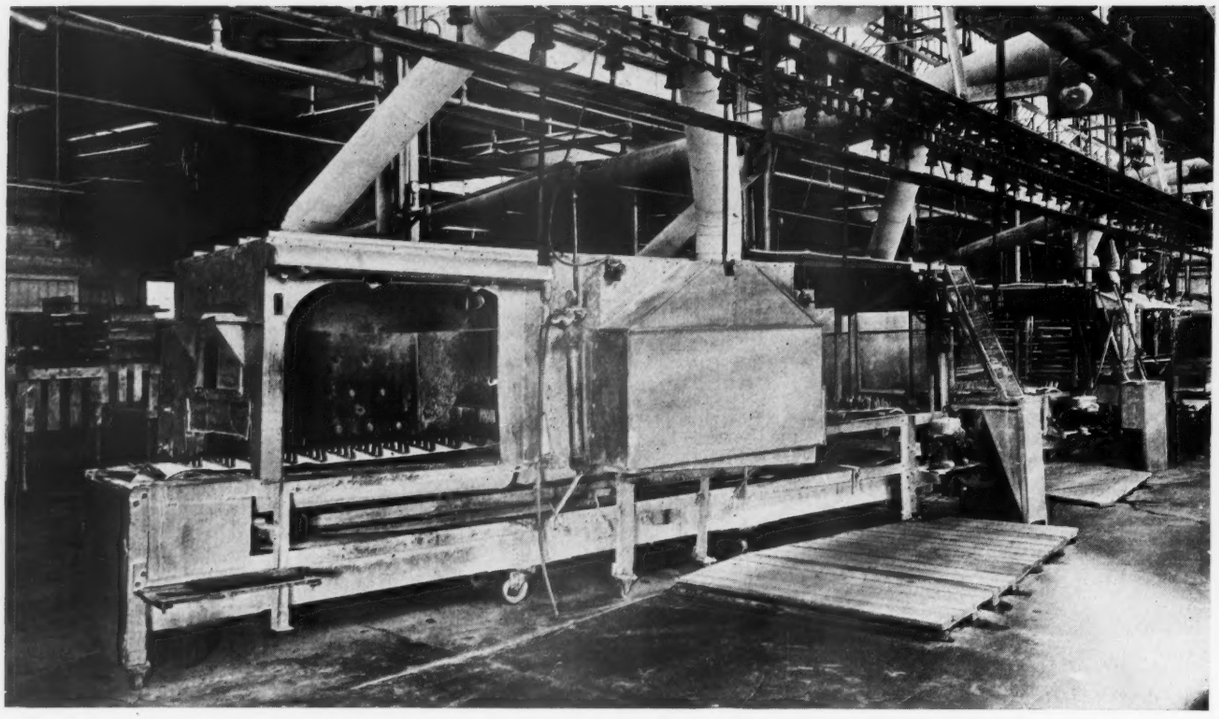


It takes only 10 minutes to replace these portable spray booths with dip tanks containing ground coat for next lot

CHANGES LAYOUT TWICE

There wasn't room to place enamel dip tanks and spray booths in fixed positions, so they were put on wheels. Handling was solved with a conveyor and rotary tables

E. F. GEHRIG
Porcelain Superintendent
Detroit Michigan Stove Company
Detroit

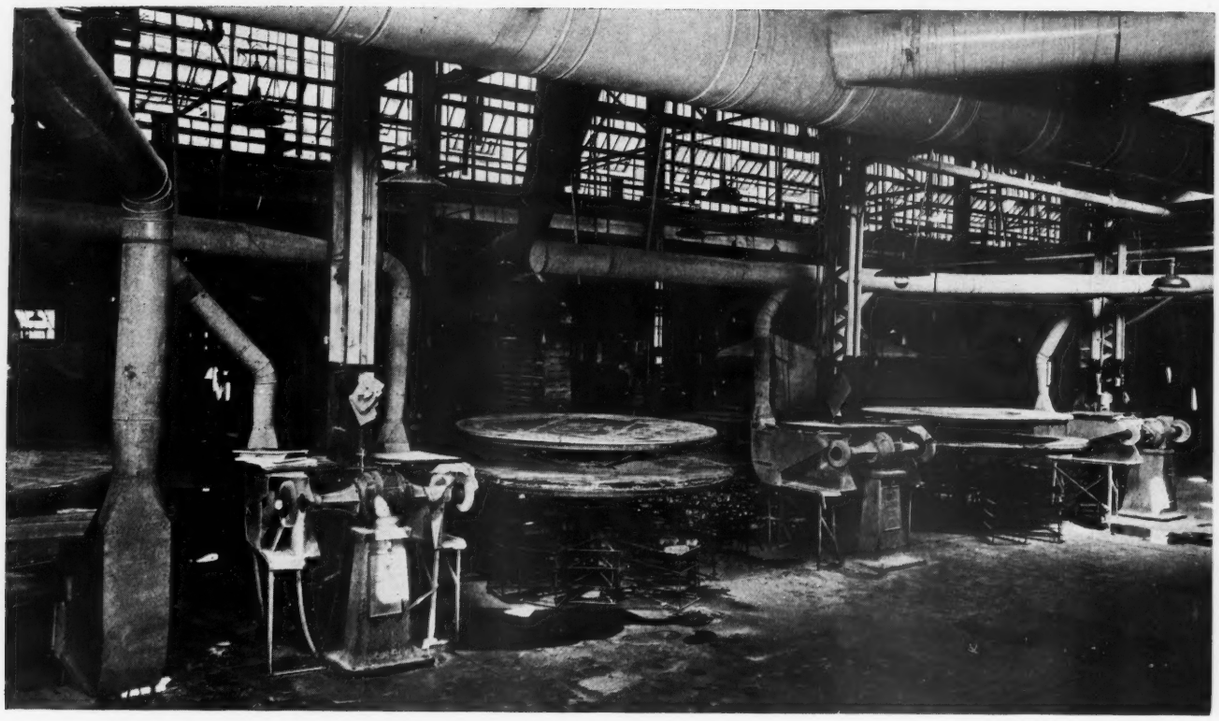
MANY COLOR combinations as well as a great volume of irregularly shaped pieces to be handled make the enameling room of a stove plant a real problem in layout and materials handling. Moreover, space and expeditious handling methods for cooling parts between each spray and burn must be devised.

To provide for the many color combinations, our main enameling room was changed from the box-type burning oven to a continuous, gas-fired, automatically controlled oven. With the volume of production this department was called upon to handle, the older, intermittent method of firing was too slow and involved high materials handling costs.

An overhead, continuous, chain conveyor with suspended racks travels the 300-ft. length of this department. Over the one end of this conveyor is the drying oven, and over the other, the burning furnace. The sides of this conveyor are 3 ft. apart, and the conveyor travels at 11-22 ft. per min., depending upon whether a ground or finish coat is being run. The processes carried on, dipping, spraying, buffing, and cooling, are synchronized with the conveyor.

To the left, facing the drying end and next to the wall, is the space reserved for storing the process material as it cools between heats, or waits for inspection or matching preparatory to assembly. An ample aisle separates this section from the space adjacent to the conveyor in which are located the auxiliary spray booths and the two conveyorized spray booths. The latter are near the furnace end of the conveyor. On the opposite side of the conveyor are the rotary transfer tables and double-end buffing wheels.

The point to be stressed here is the method of interchanging the auxiliary spray booths and the dip tanks for applying the ground coat. To give this its proper setting, however, some details of the operations auxiliary to it must be given. Omitting then for the time being, a description of the ground coat application, there are



Double-end buffing wheels and rotary transfer tables are located on opposite side of conveyor from spray booths

E A DAY

two finishing coats applied. From the spray booths the parts are hung on the conveyor racks as they pass by, and are carried through the low-temperature drying oven to be removed on the opposite side of the conveyor and placed on rotary transfer tables.

The buffer operators, located between two tables—one table serving two buffers—remove the pieces and buff the sections, which must be free of enamel. These operators place buffed pieces back on the rotary table, to be taken off by the transfer boys and hung back on the conveyor. These pieces are then taken through the firing oven. Emerging from this oven, pieces are removed and stacked on wooden dollies to cool. These are stored next to the wall in the space reserved for process stock.

When the pieces have cooled sufficiently, the dollies are brought to the loading end of the conveyorized spray booths, or to the auxiliary booths if the quantity exceeds the capacity of the former, and the second coat is added. Exactly the same process is followed with this coat as with the first, except that after the trip through the burning furnace the pieces are inspected for finish and matched for delivery to the assembly line.

The building in which the enameling is done is not large enough to handle the 13,000 pieces that must be processed daily, if the ground coat dip tanks and the spray booths are established in fixed positions. To use the available space most economically, therefore, it was decided to dip and fire the ground coat at night and run the two finishing coats during the day. Oven liners and other irregular parts are still fired in the box furnaces, as their shapes prevent their processing in the conveyorized booths.

Wheel In, Wheel Out

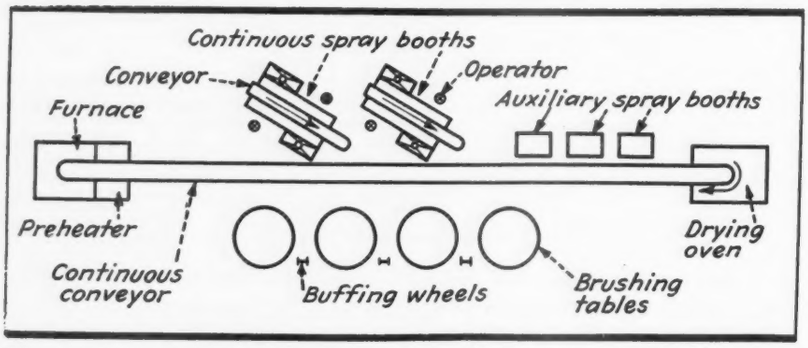
Since space was at a premium, all dip tanks for the ground coat and the spray booths for the finishing coats are placed on wheels. At the end of the day shift, booths are wheeled out of their positions adjacent to the conveyor, and the dip tanks are wheeled into the same positions for the night shift. This interchange takes about ten minutes. Now the ground coat, except for the odd-shaped parts mentioned above, is applied and handled on the conveyor in exactly the same way as are the finish coats.

While the dip tanks and spray booths are movable, fixed stations are provided for them. These fixed stations are serviced by exhaust ducts, air hose valves, and electric plugs for connection to the motor operating the conveyorized spray booths. When the shift is made, these connections are easily changed. Without this arrangement a building extension would have been necessary, and this space could not have been used effectively unless the area for serving the conveyor was also increased, but this would have raised the total capacity beyond the needs of the moment, and beyond the needs which could be foreseen.

At present two of these booths are used. They are portable as described, and set at a 45-deg. angle to the conveyor travel. With moderate or low schedules, they are not wheeled out of position for the ground coat dip tanks, for under these conditions the space is not needed.

These booths are about 20 ft. long, with two adjacent spray sections, one on each side of the belt conveyor. On the belt's return travel it runs through a tank of water, in which the water, agitated by air forced through openings in a pipe, cleans the belt and the attached metal lugs, and insures clean, paint-free resting places for the next parts to be sprayed.

Pieces stacked on the cooling dollies



Ultimate in compact, flexible layout is obtained in this enameling room where portable spray booths and dip tanks can be interchanged in a jiffy

previously mentioned are wheeled into position at the loading end of these booths. Each piece is placed in position on sheet metal lugs which extend two inches above the belt. Pieces then travel through the first spray section where the near side is sprayed by the operator; the second spray section covers the other side. At the unloading end, the pieces are removed and hung on the overhead chain conveyor for passage through the drying oven.

This flexible layout was designed especially to provide the economical handling of work without adding building space. With the increases in production and color combinations encountered at the time this installation was made, it was impossible to operate under the intermittent conditions imposed by box ovens. The layout is compact and each square foot of floor space is used effectively. The successful operation of the whole plan, of course, centers around the interchangeability of the dip tanks and spray booths.

Safety Manikin Shows Up Accidents

RICHARD S. SCHULTZ
The Psychological Corporation
New York

USE OF A SAFETY MANIKIN helps accumulate accident information on individual employees, and shows why the accident-prone individuals are that way. It goes a step beyond the usual safety campaign and by the analysis it automatically offers, suggests accident-prevention ideas.

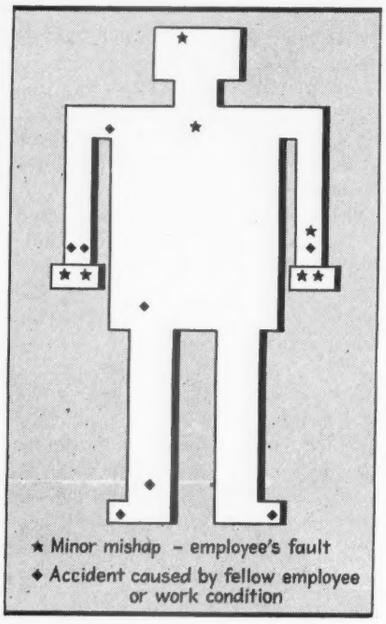
A safety manikin chart should be made for each employee. The chart illustrated shows fifteen accidents charted over a period of several months, only seven of which were the employee's fault. The remainder were apparently due to working conditions and to other workers.

Pictorial records of this sort, together with explanatory information, indicate the factors that must be considered in fostering a safety program. They place each individual in relationship to the whole group, and charts for the group will show departmental safety characteristics. This is different from individual records that show only what the individual's experience has been, and do not show how others influence his safety habits.

Inspection of the individual manikins of the group might focus attention on a particular type of accident that can be avoided in the future by proper supervision. Such an approach may be helpful in emphasizing the points at which supervisory training should be stressed.

This safety manikin is based on three psychological methods:

1. It aims to study the behavior situations in terms of a *total picture* and then to describe specific factors as they appear in a natural setting. This is different from the usual laboratory approach to accident-proneness where a specific factor is studied while the other variables are carefully controlled.



Safety committees, supplied with manikin records, are better able to plan accident-reduction campaigns

2. It is a method for bringing out *individual differences in capacity*. Analysis of the manikin will show that on some jobs physical alertness and certain musculature and bodily movements are particularly essential. An accumulation of manikins over a period of time will identify individual capacity essential for a particular job. One safety engineer subtly commented on the use of the manikin chart, saying the head is useful for recording where the troubles are mental and not muscular—referring, of course, to day-dreaming, poor judgment, carelessness, and the like.

3. It builds *safety habits*. For example, an individual's manikin shows that he is having minor injuries primarily confined to the hands and fingers. This brings home the need for more attention to certain habits. It is necessary to discover the extent to which this man is lacking in skill for the job, needs special training in use of equipment and tools, or should exercise more care in conforming to certain safety regulations. Or, if the analysis shows that the employee is not to blame, it may place the responsibility on other employees who do not have desirable safety habits.

The safety manikin is an additional technique to use in studying the human factor in industrial accidents. It is based on two fundamentals of a good safety program:

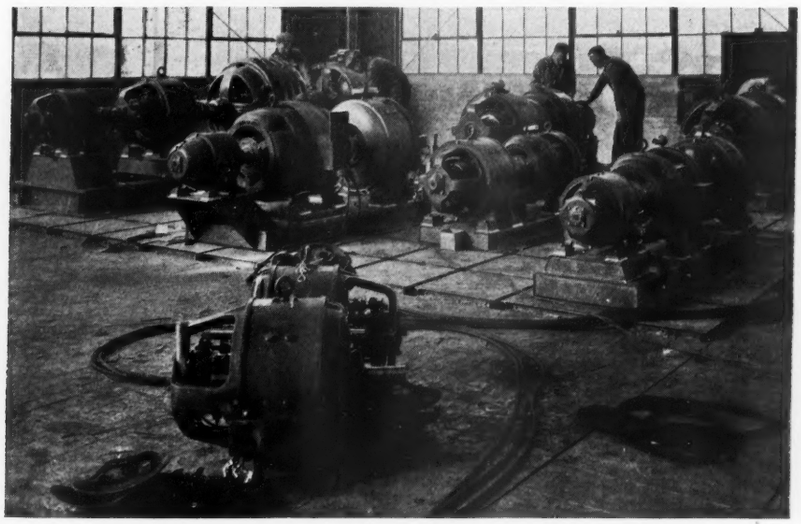
1. Identify at the earliest possible opportunity employees who are prone to accidents and injuries.

2. Provide employees with a strong safety motive and enlist their cooperation in the safety program.

This Floor Is Always Level

Do you make heavy equipment like motor-generator sets that must be erected and tested under ideal conditions? If you do, this floor's your dish and you can build one like it

S. B. TAYLOR
Works Manager
Reliance Electric & Engineering Company
Cleveland



Built to extremely close tolerances of structural steel and concrete, this unusual erection floor is sufficiently isolated from the vibration of the shop floor proper. Slots conveniently located in channels and I-beams make it possible to bolt down machinery in any position. Thus the motor-generator sets shown here are erected and tested under conditions approaching the ideal

TO AID IN ERECTING and testing large motor-generator sets, we installed a unique erection floor mounted on a concrete foundation. The design was made by the Cleveland architect, Wallace H. Hatch.

Requirements of the floor were (1) that it make possible the bolting down of machinery in any position, (2) that the tolerance of planity be and remain 1/64 inch in spite of the heavy undistributed loading to which the floor would be subjected, (3) that it be isolated from vibration of the shop floor proper.

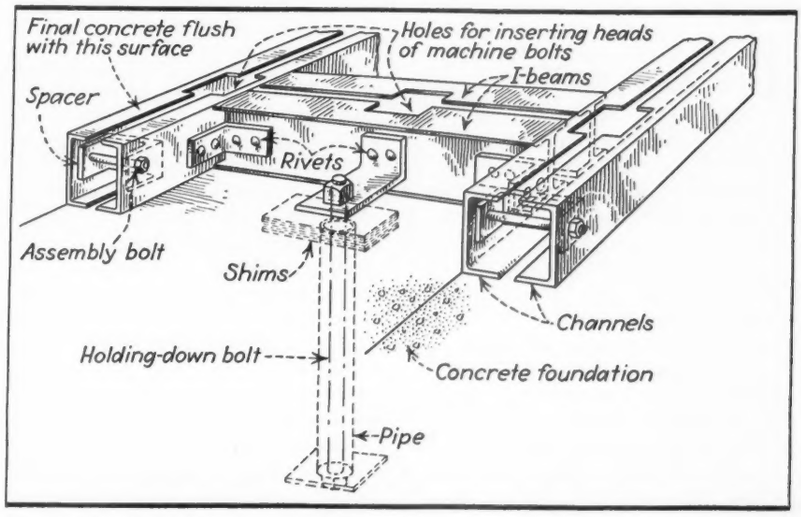
Novel features of this floor are the use of standard-shape channels and I-beams, and the way the floor was leveled. From 3 to 4 feet of concrete was laid down to the shale underlying the soft clay of the region. Around this concrete about ½ inch of sand was placed to help isolate vibration. Holding-down bolts were set into this concrete block approximately 2 feet apart. Pipes were placed around the holding-down bolts to permit a slight lateral movement of the bolts when lining up with the steel structure laid above them.

The steel structure was riveted in 2 x 20-ft. panels in the shop of the supplier, who assembled the panels face down on a surface plate. The top of the panel came perfectly level, while variations in structural members appeared on the bottom, which was placed next to the concrete base. The 2 x 20-ft. panels were laid side by side and bolted together.

No Truckers Wanted

Leveling was accomplished by a transit, level, and a long straight-edge. Shims were placed around the holding-down bolts, and the whole base was drawn down tight to meet the 1/64-in. tolerance of planity. To prevent truckers from running over it, the floor, 20 x 24 feet, was raised 2 inches above the surrounding shop floor. The frequent spacing of slots in both channels and I-beams facilitates the placing and removal of the bolts that hold down machinery.

Although this erection floor has seen severe use for almost three years, it has suffered no perceptible unleveling. And it has proved to be sufficiently isolated from shop vibration.



Structural details of an erection floor which was built level within a tolerance of 1/64 inch—and which remains level despite the heavy undistributed loading to which it is constantly being subjected on erection and test jobs

The repair shop is equipped with machine tools and other facilities for handling any work that may be sent to it

Sure and Simple Maintenance

It is relatively easy to control maintenance costs if you don't mind getting all tangled up in red tape. Trick, if any, is to do the job with little paperwork. Here's one way

J. H. PRATT

Vice-President, The Liquid Carbonic Corporation, Chicago

MAINTENANCE WORK around a large plant embraces a considerable variety of activities of widely differing character. Nevertheless, they must all be coordinated and directed toward a common end. A considerable part of the work is of emergency nature; the remainder is largely routine. On the other hand, it is necessary in the interest of efficiency and low cost to plan and schedule all work as much as feasible. There must be adequate supervision and direction of men doing a kind of work that does not readily lend itself to close control.

In the effort to obtain the close control over activities and expenses that good management requires, it is easy, perhaps natural, to work out an elaborate and costly system full of red tape for handling all maintenance work. Whether, or when, such systems are justified need not be argued here. Our policy has faced in the opposite direction. That is, we have tried to keep our system of handling maintenance as simple as possible, consistent with the results desired.

Our organization manufactures soda fountains, brewery equipment, carbonated beverage bottling machinery, beverage flavoring extracts, carbon dioxide gas, and various other products related in some way to the foregoing.

The Chicago plant comprises nine main buildings of brick and concrete construction, which are grouped on a 22-acre plot of land. In these buildings there is more than 700,000 sq. ft. of floor space. As might be expected from the nature of our products, the 34 departments in the plant carry on widely diverse operations including metal working, woodworking, marble cutting and polishing, sheet-metal work, plastics molding, foundry work, and metal finishing. In all, about 1,200 machines of one type or another are operated, of which approximately 800 can be classed as production machines.

These machines are driven by 800 three-phase, 60-cycle, 220-volt a. c. motors which range in rating from ¼ to 250 horsepower. The aggregate rating of all our motors is about 4,500 horsepower.

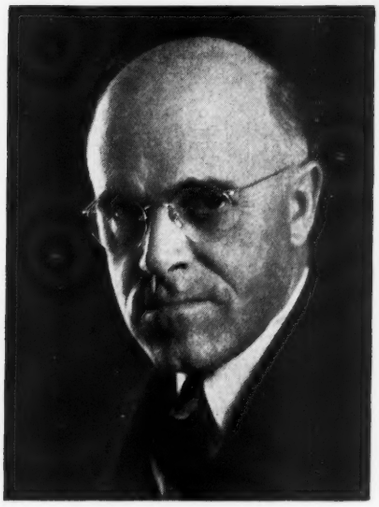
Electrical energy is purchased from the Commonwealth Edison Company on a rate which is based on the connected horsepower. It is delivered

at 2,200 volts and is stepped down to 220 volts through four banks of transformers located at the chief load centers.

About 60 per cent of all our machines are driven from lineshafts, the remainder being equipped with individual motors. The lineshaft or group system of driving was adopted because it was considered to offer a considerable saving over the use of individual motors. That saving is based on the fact that although four machines, for example, may be rated as requiring 5 hp. each to drive them, the four can be successfully operated from a lineshaft driven by a motor of considerably less than 20-hp. rating. It is very unlikely that all the machines will require the maximum horsepower at the same time. Since payment for current is made on the basis of connected horsepower, it will be seen that it is possible to effect a considerable saving in power bills by driving the machines in groups.

To minimize the possibility of production interruptions caused by trouble with or failure of a lineshaft motor, the machines are driven in comparatively small groups. Some lineshafts that formerly required a 40-hp. motor have been split up and the sections are now being driven by 5- or 7½-hp. motors.

When a motor is installed the load is carefully checked. The hand truck on which the instrument kit is transported was made in the repair shop



The author received the degrees of Bachelor and Master of Science in Chemical Engineering from M. I. T., and entered the employ of The Liquid Carbonic Corporation in 1913 as junior engineer. Five years later he was made general superintendent. In 1924 he became assistant vice-president, and a few years later, 1930, was given his present title of vice-president. In this position his responsibilities include supervision over the operation of 28 plants and warehouses in this country and Canada.

Maintenance and repair work on all equipment and buildings is in charge of the master mechanic. He reports directly to the manager, a vice-president whose responsibilities include supervision over the corporation's 28 plants and warehouses in this country and Canada.

In the maintenance department there are 72 people, including four firemen; four engineers; seven machinery movers; four elevator operators; five pipefitters; one painter; one plumber; eight electricians; three millwrights; nine machinists; seven janitors and porters; five watchmen; one window washer; two oilers; two belt men; two clerks; eight general laborers. Each of the main divisions represented in this list has its own working foreman or supervisor who is responsible to the master mechanic for properly scheduling and conducting routine inspections, and handling emergency repairs satisfactorily.

Much of the work of the maintenance department is of routine nature, involving frequent inspection and prompt repair or adjustment where these are needed. Frequency of inspection is determined by the kind of equipment and the conditions under which it operates.

For example, the frequency with which electrical equipment is inspected depends largely on the amount of dust present in the atmosphere of the various departments. In the foundry, which is quite dusty, the electricians examine the motors and controls once a week. The same schedule is maintained in the machine shop and engine rooms. In the screw machine department an electrical inspection once in two weeks has been found to be adequate, while in the marble department an inspection once in six months is satisfactory. In this section marble dust is prevented from causing trouble by laying it with water.

Trouble with motors cannot be entirely eliminated by frequent inspec-

tion but delays due to such troubles are minimized by maintaining a spare for every motor up to 40-hp. rating. It is the responsibility of the repair shop to make sure that these spare motors are always in good condition and available at a moment's notice.

About 50 per cent of our motors have anti-friction bearings, the remainder being equipped with the sleeve type. Anti-friction bearings are widely used also in lineshafts. Therefore lubrication schedules vary widely. A few pieces of equipment are oiled twice a day, whereas some motors and lineshafts are greased only twice a year. All other equipment falls somewhere within these limits, depending on the requirements.

The two belt men have the responsibility of keeping all belts in good condition. All are under practically constant inspection, particular attention being paid to endless belts. Any defects such as loosening of the plies or laps are attended to immediately. By detecting and remedying all troubles while they are small we prevent them from becoming serious.

Much of the maintenance of buildings and structures is also on a definite schedule. For example, painting of all exterior surfaces that require such treatment is done regularly every third year, in the spring, before hot weather sets in. The best paints are used and we have found that with this schedule exterior surfaces can be kept in perfect condition.

Roofs on our buildings are of the built-up type. They are all carefully inspected once a year, and repairs made when necessary.

In the fall, well in advance of cold weather, all windows in the plant are inspected and put in good condition by replacing cracked or broken panes, frayed sash cords, and so on.

Windows are regularly washed twice a year, in spring and fall. It was formerly the practice to keep two window washers constantly at work. The result was that some windows were clean while others were dirty. Never did the plant as a whole have clean windows all around. Now a gang of men is put to work at clean-up time, and at least twice a year every window is sparkling clean.

Floors naturally come in for a good deal of attention. Maple flooring is used in some departments, concrete in others. A safety committee composed of two employment managers and the master mechanic frequently inspects the floors in all areas. Whenever any member of this committee finds a spot that needs repairing a written report is sent to the plant manager. An order is then issued covering the necessary repairs.

Plumbing is another item that requires, and is subjected to, constant inspection. The plumber serves as his own inspector and spends most of his time making the rounds of the washrooms looking for leaking faucets, plugged sewers and drains, and defective toilets.

The remainder of the work of the maintenance department can be divided roughly into (1) emergency calls, and (2) making alterations or repairs on buildings and equipment, installing or moving machines, and similar tasks.

REQUEST FOR
MAINTENANCE DEPARTMENT LABOR

(Other Than Direct Labor)

To T. Columbe Dept. Date 10-12-38

Make Repair Repair Drive on Machine #4801 Planer

Charge Dept. No. 43 Acct. No. 208 Mach. No.

Date Required S.A.P. Signed J. McGourty

Form 0537

When other than minor or routine work is to be done, a request is made on this form. If the estimated cost is more than $50, approval of the plant manager must be obtained. Details of the work done are noted on the back. Upon completion of the job the form is put in the machine record file

Reports via Telephone

Emergency calls for service involve for the most part blown fuses, burned-out lamps, steam or water leaks, broken belts, and the like. Reports of such troubles are phoned, usually by the foreman of the department, directly to the master mechanic's office. A clerk in this office then calls the foreman of the maintenance division concerned, who sends a repairman at once.

For minor work of this general

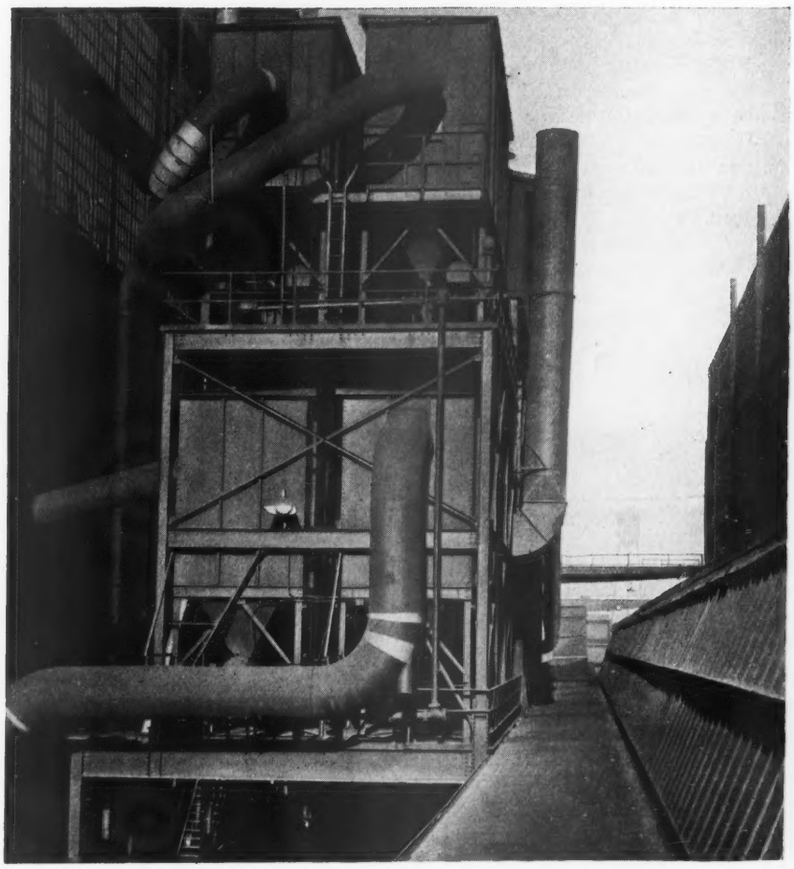
(Continued on page 128)

In these files there is an individual folder for every machine, which contains a complete record of all repair work done on it

Why Not a Dust-Free Foundry?

Dodge management asked that question, then answered itself with a dust-collecting system that catches just about every particle—which adds up to a clean workplace and a satisfied working force

C. B. GORDY
Detroit Editor



Water pumped to the top of these wet units on the east side of the foundry building washes the dust that comes from the collector points down into a tank below. This tank, in turn, empties into a cellar tank from which the dust-laden water is pumped to dewatering units shown on the next page

ORDERS WERE ISSUED to clean up the Dodge Foundry. It had, at the time, no more dust and smoke than the average foundry, but it wasn't enough that it be just as good as others—the order implied that it must be better.

Management's viewpoint was that, despite the size of the problem and the inherent difficulties involved, there was no fundamental reason why foundry work should not be conducted under clean and dust-free conditions. Moreover, and this is an important angle, ventilation systems had been developed to a point where an order to clean up could be executed, provided sufficient money was appropriated for the purpose.

The problem naturally divided itself into three parts—smoke removal, dust removal, and heat disposal. The size of the foundry building itself, 400 x 140 ft., together with the six-story building in which cleaning, core making, and other foundry operations are conducted, conveys an idea of the Herculean task assigned to the plant engineering department. But size was not the only difficulty; the foundry buildings are surrounded on three sides by four- and five-story manufacturing buildings in close proximity. This, together with the fact that the plant is located in a thickly populated area, made it necessary to design the ventilation system so that air discharged to the outside would be dust free.

As designed and, except for some refinements, completed, the system handles 1,180,420 cu.ft. of air per minute and requires 1,530 motor horsepower to operate it. Thirteen men are needed to operate and maintain it for three-shift operation. Net result is the collection of some 80 tons of sludge per day, a dust-free foundry, and no unneighborly dust contamination of the air that is discharged from the building.

Those Twin Enemies

Dust and smoke, the twin enemies of a foundry, are generally handled separately. Large exhaust fans draw the smoke through hoods placed over the pouring conveyors, the shake-out, and the mold conveyors, the latter being completely inclosed in sheet-metal hoods. The smoke is then exhausted into the outside air through stacks above the buildings.

But at the shake-out points on the four molding lines in this foundry, smoke and dust come together and have to be handled jointly. In the new system this is accomplished by an exhaust fan and hood for the smoke, located above the shake-out point, and a dust-collection fan mounted below the shake-out level. The sand, of course, drops through a grating into a hood discharging to a conveyor, and the conveyor takes it back to the conditioning mills.

From the hood a suction pipe leads off to the dust-collecting system which removes all fines, and thus insures remarkably clean operating conditions. The operators do not have to contend with dust and smoke at the

breathing level. At the shake-out point on one of the mold lines, for example, a 5-hp. motor exhausts the smoke, handling 9,500 c.f.m., and a 25-hp. motor, exhausting the same amount of air per minute, gathers the dust.

The shake-out is not, however, the only point at which dust and smoke must be collected before the castings reach the cleaning section. After the blocks and other parts have been hung on conveyors following shake-out, they travel under a hood which collects and exhausts the smoke still given off by the hot metal. The blocks are then set into a fixture and tapped by air hammers to rattle off sand that still clings to them. Sand from this knock-out falls through a grating in the floor, and is handled in the same way as the sand from the shake-out at the end of the mold line, just described, the fines being exhausted below the floor level by a lead from the hood.

Waste sand is gathered from the dumping stations and shake-out points by the conveyor under the floor. Furthermore, at every transfer point in the sand-handling system, a hood is provided that draws the fines created by the transfer into the dust-collecting system.

An interesting example of the care exercised in keeping the foundry air free from dust is afforded by the several dumping stations. Small castings are handled from the shake-out points to the tumbling barrels in electric dump trucks. Special stations are provided where sand accumulating in these truck bodies may be dumped before the trucks pick up new loads. Again, the discharged sand drops through a grating to the waste-sand conveyor under the floor, and a suction unit gathers the fines.

Roughly one-third of the main foundry floor is taken up with cleaning the castings coming from the mold lines. These are the usual sand-blast, tumbling, grinding, and chipping operations. Over each separate grinder, tumbling barrel, and sand-blast unit, there is an exhaust or suction fan to gather into the collection system the dust created. On the chipping conveyor, a collection unit is provided at the point where air is used to clean off the casting.

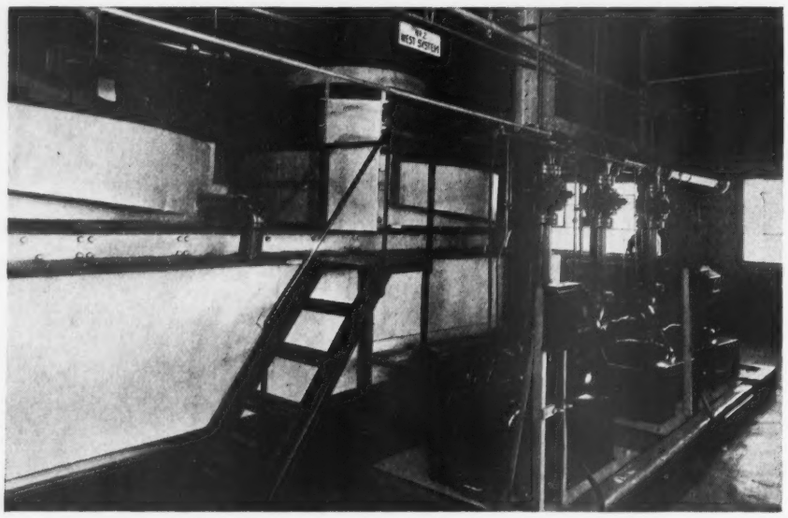
Other points, such as the rotary core grinder and the conditioning mills, are included in the general collection system. For the mills, one dust-collecting unit prevents dust from their operation getting out into the breathing area, and another collects fines at the point where sand is discharged to the conveyor running to the molding machines.

About one-third of the 1,180,420 cu.ft. of air handled per minute in the foundry and core rooms consists of fresh air brought in from the outside and supplied to various spots, including the shake-out stations.

While the dust-free condition in this foundry has to be seen to be fully appreciated, some conception of it may be gathered when it is stated that 80 tons of wet waste sand are collected and disposed of daily. Dust counts at various points are taken periodically, and pressure readings are taken before the air enters the collectors to insure that they are functioning properly.

Dust exhausted from the collecting points mentioned above is gathered into two disposal systems, one on each side of the building. Dry and wet collectors are combined on one side of the foundry while wet collectors, mainly from shake-out and sand preparation, are on the other side. Dust from the dry units is delivered by cone-shaped bottoms to a pipe in which water carries the dust to a tank in the basement. Water is pumped to the top of the wet units and washes the incoming dust down through the collectors into a tank running below them. This tank, in turn, empties into the cellar tank.

From this central point the dust-laden water is pumped to slowly revolving, flat table of the dewatering unit. The water, separated from the sand by a gentle settling action, is pumped into a cone-shaped clarifying tank in which the remaining suspended sand particles are removed. The water is then, with some 40 gallons of fresh water added each minute, recirculated through the dust collectors.



Upper part of dewatering units is a slowly revolving flat table which separates sand from water by a gentle settling action. From here the water goes to a clarifying tank in which the remaining fines are removed. Sand is carried via screw conveyor to a bin from which freight cars are loaded

Into a Waiting Freight Car

From the dewatering unit and the clarifying tank the wet sand is dumped into a waiting freight car. Eight motor-driven pumps maintain this constant circulation of water through the collectors, the dewatering unit, and the clarifier. Waste dry sand that cannot be reconditioned is fed into the screw conveyor, which also delivers the wet sand from the dewatering unit to the bin from which the freight car is loaded.

Maintenance of this system is under the direction of an operating engineer who reports to the plant engineer. He is assisted on each shift by a millwright, three operators, and a pressure reader. Pressure readings, taken ahead of each dust collector to check its operation, are made twice each shift.

An attempt has been made to describe the methods adopted to carry out the order issued in 1935 to clean up the foundry. The experience so far is that, while the investment and operating costs are of course high, the air is clean and the work can be done much more pleasantly than before. The investment was not made with the object of gaining a specific saving in operating costs, nor can such savings be calculated, but we do have a clean workplace and a more satisfied working force.

They Blamed the Motor

Trouble shooter *en route*; the superintendent decided it would be cheaper to get him than to send the motor back

GEORGE H. HALL
Consultant, New York

SUSPECTING that the electrician was having trouble with a motor which he had just installed, the superintendent stopped and asked, "Is it all right?"

"It is not," the electrician replied as he straightened up. "It's all wrong; it simply won't run."

"Are you sure the trouble is in the equipment?"

"It can't be anywhere else. The switch is closed; the fuses are all right; connections are correct. No, we'll have to send it all back to the factory, or else have one of their men come over and look at it."

The superintendent decided it would be cheaper to get the manufacturer's trouble shooter than to send the motor back.

When the trouble shooter came his first question was, "How's your voltage?"

"Same as the nameplate on the motor—220 volts," the electrician assured him confidently.

"Are you sure? Where's your voltmeter?"

"On the switchboard. We keep the voltage up to 220 all the time."

"Maybe you do, but I want to know the voltage here at the motor. Anyway how do you know the motor is big enough?"

"That's easy. We tested the machine at full load and it took 9.5 horsepower; so we put on a 10-hp. motor. That ought to be big enough."

"All right," said the trouble shooter. "Get your voltmeter. We'll start at the beginning."

A few minutes later the meter showed 200 volts at the motor terminals.

"Some of your trouble is right there," declared the trouble shooter. "Remember that starting torque varies as the square of the voltage. You have a big line drop. Probably the circuit isn't wired for 10 horsepower. What compensator tape are you using?"

"How should I know? It's just as it came from the factory, and ought to be all right."

"For ordinary conditions, yes. But you have a heavy starting load and the voltage is down to 200 volts, which reduces the starting torque more than 15 per cent. The compensator is connected on the 65 per cent tap, which is standard practice. As a result the torque is 'way below what it would be on full voltage. If you will go to the 80 per cent tap, you can probably boost the torque enough to start the motor."

When this change was made the motor started without difficulty.

"Well," said the electrician, "I have learned something I'll remember. Better remember, too," the trouble shooter continued, "that for such a load as you have here you should use a high-starting-torque motor."

"That's a good suggestion," the electrician admitted, "but on these jobs we have to count the cost. Such motors cost more than the general-purpose motors we are using."

"Of course they do, but not much. The compensator costs considerably more than the difference. You can get the right type of motor with a magnetic starting switch for less than you are paying for this equipment, and you'll have a better application."

This is exactly what took place in one plant, and the same kind of thing is happening day after day with all kinds of motor applications.

In the early days no great difficulty was experienced in applying motors. There were only a few types, and since most machines were driven from lineshafts it was a simple matter to connect motor and shaft by a belt. One of the chief requirements was to use a motor that was large enough to pull the load. This problem was simplified by the fact that motors were liberally rated, so that overloads usually could be handled without any trouble.

Motor applications are not quite so simple today. Many machines have individual motors, and the loads imposed vary widely in their charac-

teristics. Different types and designs of motors have been developed to meet these needs. With these new motors there have come new control devices that direct the operation of the motor with uncanny precision. No wonder there are so many opportunities to make mistakes in motor and control applications!

Fortunately, a great many applications are so simple that there is not much chance of serious error. All that is required is a standard motor with a simple controlling device that will serve to start and stop it, and protect it from dangerous overloads. Furthermore, the engineering department of any motor or control manufacturer can be called upon for advice in selecting the most suitable type of equipment for any application. Failure to consult the manufacturer, or to give all the pertinent facts about the application when ordering the equipment, is the cause of much of the trouble that is encountered.

Watch When You Change

Another frequent source of error lies in the common practice of changing motors and controls from one application to another whose requirements may be quite different, or picking out spares from the storeroom when need arises, without making sure that they are suited to the job in every way.

For example, when another motor was needed to drive a new machine, the chief electrician in one plant decided to use an intermittent-rated motor that had recently been removed from another application where it had served very satisfactorily. He was "pretty sure" that the motor was large enough and that the new machine would not be operated continuously.

For a month or so intermittent operation of the machine gave the motor a chance to cool off, and no trouble was encountered. Then new orders came in, the machine was speeded up somewhat, and full-time operation started. Of course, under the heavier load and continuous running the inevitable happened—the winding roasted out and production was seriously delayed.

Failure to provide suitable protection against abnormal conditions has caused a lot of trouble. For example, with a private generating plant phase reversal may sometimes take place. If one has not had such an experience it is difficult to imagine the chaos that can be caused by machinery running in the wrong direction. Although reversal of phase is not likely to occur very often, it is well to provide motors driving machinery that cannot stand reversal with a protective relay that will not only prevent reverse operation but will also shut the motor down at once in the event of single-phasing. The slight increase in the cost of the equipment may well be repaid by a single emergency.

One of the most common reasons why motors either fail to go at all, or do not perform properly, is because someone connects the motor and control from memory, or in the way he thinks they should be connected. Too often the wiring diagram is carefully pasted up somewhere, or filed away and forgotten. This way of disposing of it may keep the diagram safe, but that is not the object in supplying it.

Some men may not have to use a diagram, but if the others would carefully follow it, motor manufacturers would receive far fewer complaints than they do now, and there would be much less trouble all around.

When a salesman called on a printing plant that had recently purchased a number of wound-rotor motors to drive the presses, the manager was waiting for him.

"They won't cut the speed down," he complained, pointing to the rheostats which were supposed to give about 50 per cent speed control. "The presses run just about as fast when the arm is 'way down to the lowest speed point as when it is at full speed."

"As I recall it," explained the salesman," we were not told what the motors were to drive. You just ordered motors and regulators through one of our agents."

"That's right. I knew what we wanted."

"But we didn't. So you got controllers with machine-type resistors. They do not have enough resistance to cut down the speed on your kind of load. We should have had the whole story."

"Well, I thought a speed regulator was a speed regulator. The agent from whom we bought them did not raise any questions."

"That may all be, but it doesn't help you out now. You may need special resistances for this job, but

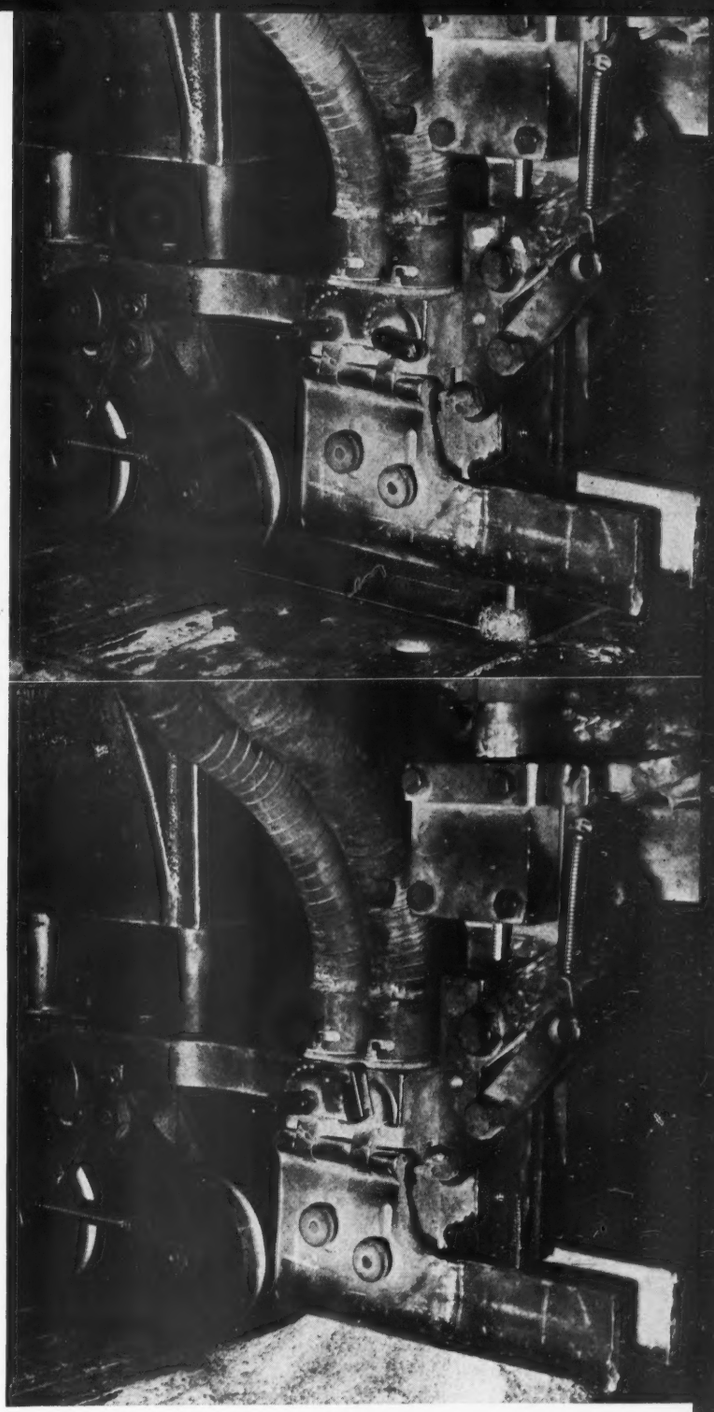
(Continued on page 128)

When the motor was supplied with a suitable lubricant, it settled down to the humdrum existence that permits maintenance men to sleep nights

Something New *in* WELDING

J. F. ANDREWS
Assistant Editor

Clean, smooth electric welds without sparks, fumes, smoke, or light—because they are made beneath a special protective "blanket"



Fuse used to start a weld is usually a steel-wool ball inserted between welding rod and the work. The rod is lowered against the fuse; then a valve is opened so that the granulated composition material flows over and around fuse and rod. Next step is to close current and travel switches

JUST AS THERE ARE many ways to skin a cat, so are there many ways to weld. A technique recently introduced, although an electric process, differs from arc welding, and has features all its own that it contributes to the welding art.

At the start, it is worth pointing out that two methods of electric arc welding, differing principally in type of electrode used, have been common practice for some time. Of the two, the one most frequently met is the type where the welding rod acts as one electrode and the metal being welded the other.

The second type, also widely used, is carbon arc welding, either with one or two carbon electrodes. When a single carbon rod is used, the carbon serves as one electrode and the parent metal the second, the welding rod being held in the arc and melted by its heat, and dropping in a puddle in the joint being welded. Welding with two rods differs from welding with one rod only in that the arc is struck between the two carbons instead of between rod and parent metal. As before, the rod is held in the arc, where it melts and falls to the joint.

Taking its name from the trademarked composition material that is used as a protection for the weld metal and a conductor, the "Unionmelt" welding process has now been developed by The Linde Air Products Company. The composition material conducts the welding current from the welding rod, which serves as one electrode, to the parent metal, the second electrode. Since the welding action takes place beneath the material, no light, flash, or sparks are visible.

The granulated welding composition, an electric furnace product, is laid down along the seam to be welded, and the entire welding action takes place beneath it. A non-conductor when cold, the "melt" material is heated at the start of welding operations by a fuse made of a wad of steel wool. When the current is turned on, the fuse becomes sufficiently hot to melt the adjacent material, and current flows from the welding rod, through the material, to the parent metal. Welding rod and parent metal melt, as does a portion of the welding composition. Normally no portion of the melt becomes part of the weld, but alloys can be added that will fuse with the welding rod and parent metal.

In the same manner that the coating from coated or covered arc welding electrodes forms a gaseous atmosphere that acts as a protective envelope over the weld to prevent oxidation as the two metals fuse, this composition material serves as a slag-like protective blanket to exclude all gases. As the welding head moves along, the molten composition ma-

Welding head and controls show clearly in this view of an installation forming girth seams on 6-ft. sections of 52-in. pipe. Head remains stationary while the pipe revolves at uniform speed. Unfused composition material is picked up by suction, and the fused melt solidifies and falls off as it cools. A copper ring mechanically clamped in place backs up the weld

terial solidifies behind it and, on cooling, contracts and detaches itself, exposing a clean, smooth weld.

Fully automatic, the process is in the main a production welding technique. It is not a hand process, for special equipment must be used. Master craftsman of the whole procedure is the welding head which performs the triple function of depositing the granulated material along the welding vee, feeding welding rod, and transmitting welding current. Welding voltage, current, speed, and rod feed are all automatically regulated by electrical controls. The operator merely pushes buttons and adjusts controls.

Picturing the welder in action, the composition material is progressively laid down along the seam a few inches in front of the welding rod. Since only a part of the composition material fuses during the welding, the unfused portion is picked up, usually by a suction device moving some distance behind the rod, and returned to the hopper, mounted on or above the head, for re-use.

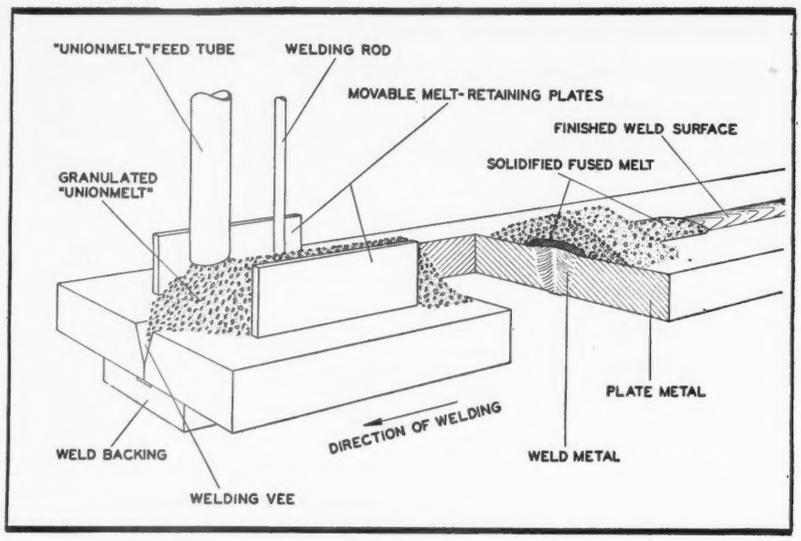
Butt, fillet, and plug welds in commonly used thicknesses of metal can be made. Butt welds, complete in a single pass, can be made at the rate of 10-12 in. per min. in 1-in. steel plate and 5-6 in. per min. in 2-in. plate. Metals of usual commercial thickness can be welded in one pass with good fusion and penetration, and steel plate of greater thickness in two passes.

trolled, and since welding takes place beneath the "Unionmelt" blanket, there are no metal losses from spatter and vaporization.

Welding skill of the operator has little bearing on the quality of the weld. Except for setting the controls, he does not have a hand in the welding procedure. At a position remote from the weld he presses buttons and operates controls, and since the process gives off no sparks, fumes, smoke, light, or harmful gases, he needs no protective equipment.

Edge preparation, when needed for butt welds, is made by cutting a small bevel with oxy-acetylene cutting torch, or planing. Usually only a partial bevel should be made, leaving a square portion. For fillet welds, no bevel is required to obtain complete penetration and center overlap of fillets in T-butt joints and plate up to ¾ in. thick.

In making butt welds where complete penetration is desired in one pass, the weld must be backed to prevent the fused metal from falling



Arrangement of materials for a single-pass butt weld

The process has been applied to low-carbon and medium-carbon steels, high-strength, stainless, and other alloy steels. It is especially advantageous where the operation is repetitive.

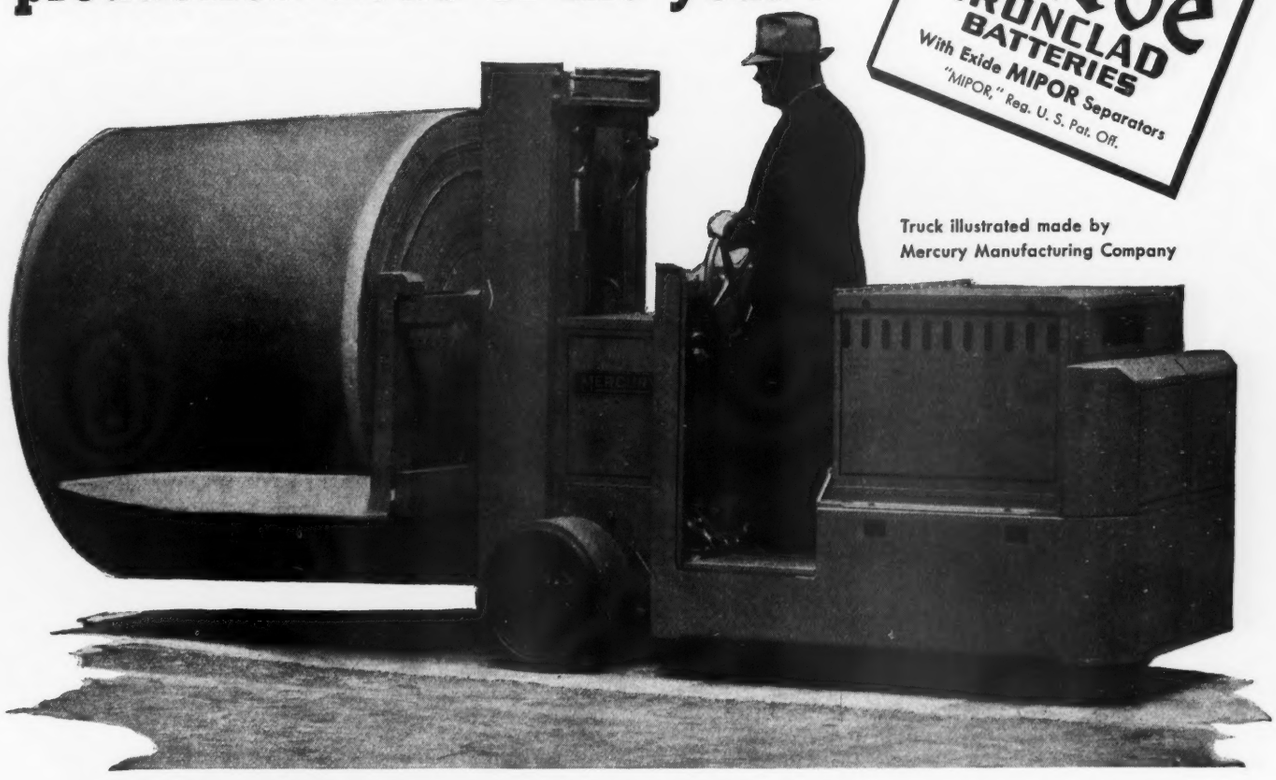
Welds are said to be of high strength, ductility, shock resistance, uniformity, density, and corrosion-resistance; physical properties are as good as those of the base metal. They meet ASME code specifications for fired power boilers and Class I pressure vessels, and are accepted by various insurance companies.

Uncoated welding rod is used, and since feed is automatically controlled through. A copper bar, sliding copper shoe, or trough of the composition material can be used. A fixed or rolling copper ring and a sliding copper shoe may be used for backing circumferential welds in cylindrical products such as pipe and tanks. Alternative materials are steel backing pieces that may remain permanently attached, or may be cut from the under part of the finished weld. If two passes are to be made, a relatively light unbacked weld made on one side of the joint may serve as the backing on which the main weld is made.

(Continued on page 130)

What is the biggest production news of the year?

Exide IRONCLAD BATTERIES
With Exide MIPOR Separators
"MIPOR," Reg. U. S. Pat. Off.



Truck illustrated made by Mercury Manufacturing Company

FROM the standpoint of industry generally, the most important production news in many months comes from the field of materials handling. Giant, strong-sinewed battery electric trucks have been built... and new power-houses in the form of storage batteries. The new Exide-Ironclads, type MEH, compactly assembled in steel trays, meet modern industry's demand for truly tremendous power. More than 45 kilowatt-hours are available in a single unit!

In many other ways, Exide has increased the production value of these trucks. The new Exide Discharge Indicator keeps the service running on schedule by flashing a warning when a battery is nearing discharge. The new Exide Charge Control Unit handles the charging of batteries with negligible attention. The new Exide "Mystery Kit" analyzes your handling jobs, showing how much battery capacity each truck requires per shift.

Most important, of course, are the new Exide-Ironclads, that insure speedy, dependable, low-cost handling, no matter how large the truck or severe the service. Write for free booklet, "In Selecting Any Motive Power Battery."

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

You want to know

more about the items mentioned on this page. Letters to the addresses given will bring information

• DRYER for lacquers, food products, blueprints applies radiant-energy heating principle to production processes. Aluminum reflector with highly finished reflecting surface concentrates heat waves while a 250-watt drying lamp supplies the energy. Edwin F. Guth Co., 2615 Washington Ave., St. Louis.

• ALUMINUM LADDER, platform type, speeds up handling and storage in bins and shelves. It stands 66 in. high, can support 1,000 lb., yet weighs only 43 lb. Casters on back of legs make it easy to move around. Aluminum Ladder Co., Tarentum, Pa.

• WELDED PIPE JOINTS can be "tailor-made" with the "Pipe-Scriber." Accurate layout for any angle can be made with its six-way adjustment, and marked with crayon that glows red under cutting torch flame. Harris Calorific Co., Cleveland.

MOTORIZED DUST PAN will pick up anything from fine dust to stones as large as hens' eggs. Its 1-hp. motor moves it at about 3 mi. per hr., and it can turn around in less than its own length. Dust as close as 1½ in. from a wall can be picked up. R. C. Howell, 6545 Carnegie Ave., Cleveland

• LETTERS can be photo-copied at the rate of 125 per hour with a compact little machine not much bigger than a typewriter. A larger model handles reproductions up to 19x24 in. Remington Rand, Inc., Buffalo.

• AMERICAN EMPLOYEES and employers are the best in the world, said William O'Neil, President, General Tire and Rubber Company, Akron, after a recent European trip. His views on industry abroad have just been published by his company in a booklet, "Let's Stick to the American Way."

• NO COMPANIES discharge workers when they reach 40, less than one per cent give preference to younger employees when making layoffs, but 38 per cent do prefer younger people in hiring, a survey shows. These and more statistics are incorporated in a booklet, "Workers Over 40," published by National Association of Manufacturers, 14 West 49th St., New York. 20c.

• EMERGENCY EQUIPMENT is easier to spot if marked with illuminated signs, like fire exits. Fire boxes, stretchers, first aid stations can be indicated by descriptive signals made from stencils and bright lights. The Lintern Corp., 7960 Lorain Ave., Cleveland.

• EDGING MACHINE applies opaque, white, acetate tape to edges of drawings, tracings, blueprints, and valuable papers, protects them from wear and tear. David White Co., Inc., 315 West Court St., Milwaukee.

• HAND LAMP, operated from portable storage battery, casts light a half mile, will burn 10 continuous hours on one charge. You recharge it through the lamp head without removing battery from its case. U-C Lite Mfg. Co., 500 North Dearborn St., Chicago.

• GUIDE to employer-employee conduct is the "Primer of Labor Relations." Virtually a handbook for industrial relations men, it has chapters on bargaining units, labor contracts, power of the NLRB, and a glossary of terms, to name only a few. Copies cost 50c. The Bureau of National Affairs, Inc., 2201 M St., N. W., Washington, D. C.

• EXTRA EARPIECE attaches to telephone receiver so that secretary or partner can listen in and act as witness to conversation. It doesn't have to be permanently installed, but can be tucked away in desk or coat pocket. John J. Ross Corp., 50 East 42d St., New York.

• METAL CLEANER is a brush-applied, jelly-like substance that removes stains by chemical action from copper, brass, bronze, and other metals, except aluminum, iron, and zinc. Rapid Electroplating Process, Inc., 1414 South Wabash Ave., Chicago.

• OUR TAXES, though much higher than a few years ago, take a smaller proportion of the average man's income than taxes of leading European nations, a pamphlet shows. For a copy of "Our Taxes—and What They Buy" send 10c. to Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York.

• HANDGUARD, made of chrome leather, protects either hand when metal sheets, stampings, or bars are handled.

GAS instead of lead shoots from this watchman's gun. Three cartridges similar to shotgun shells hold enough tear, irritant, and asphyxiating gas to disable intruders without killing or permanently injuring them. Watchmen armed with the gun need have no fear of injuring innocent people, and can shoot first and ask questions afterward. J. W. Van Karner, 224 East 47th St., New York

Steel ribbons placed diagonally on wearing surfaces give added protection from sharp edges. Industrial Gloves Co., 714 Garfield Blvd., Danville, Ill.

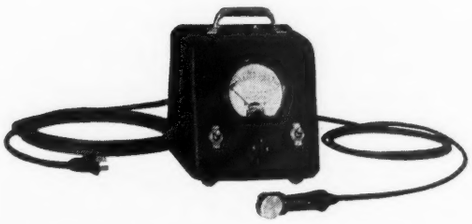
• GOVERNMENT must stop competing with private enterprise, and renounce regulative taxation if the long-term decline in the durable goods industry is to be halted, a booklet states. Farrel-Birmingham Co., Inc., Ansonia, Conn.

• MAGNET WIRE, insulated with synthetic resin, can be tied in knots or crushed in a vise without cracking or breaking the insulation. General Electric Co., Schenectady, N. Y.

• MANUFACTURERS looking for new products will be interested in a service that will try to find for them newly patented products adaptable to existing production equipment and marketing facilities. Engineering Products Service, Inc., 420 Lexington Ave., New York.

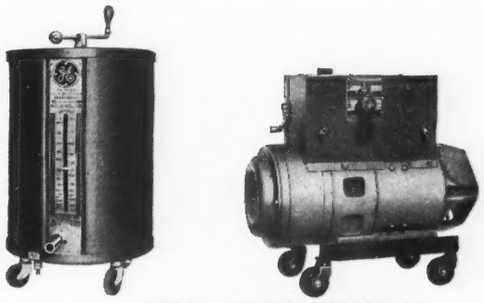
How to do it?

Check with us—there may be a new electric way that's cheaper and better



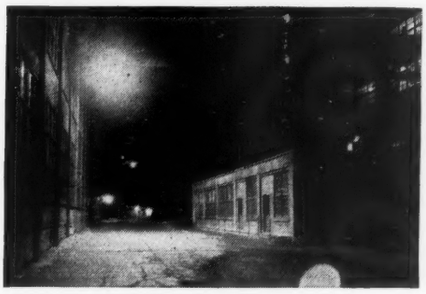
NEW ELECTRIC THICKNESS GAGE

Here's an improved thickness gage that is used to measure nonmagnetic films such as porcelain or lacquer on either flat or curved surfaces of magnetic materials. It's fast and accurate. Invaluable for inspections, etc. Ask us for Publication GEA-2851A.



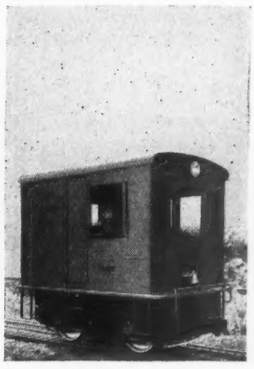
NEW ARC WELDERS

Two new arc welders, 150-ampere size, are announced. One provides alternating current for welding; the other, direct current. Both of these welders have already proved themselves real money makers on the production line and real money savers on maintenance work. We'd like to send you our new arc-welding publication, GEA-3081A.



SODIUM LIGHTING FOR YARDS AND PLATFORMS

The high efficiency of G-E sodium luminaires is saving money in some of the largest plants in the country. With sodium lighting, you get lots of light for your money—in fact, about twice as much as with incandescent lamps. It's "tops" for all outdoor work—in yards, on loading platforms, etc. Ask us for Publication GEA-2796.



NEW DIESEL-ELECTRIC LOCOMOTIVES

Here's a new line of diesel-electric locomotives for work in and around industrial plants. Weights, 10 tons and up. The electric drive means reduced operating expense, easier handling, longer locomotive life, full power at all speeds. This outstanding buy in industrial locomotives is described in our leaflet GEA-3071.

General Electric, Dept. 6C-201,
Schenectady, N. Y.

Please send me more information on the products checked.

New electric thickness gage, GEA-2851A ☐ . . . . . New low-current welders, GEA-3081A ☐ . . . . . Sodium lighting for industrial yards, GEA-2796 ☐ . . . . . New diesel-electric locomotives, GEA-3071 ☐ . . . . . .

Name . . . . . .

Address . . . . . State 98-568

City . . . . . .

GENERAL ELECTRIC

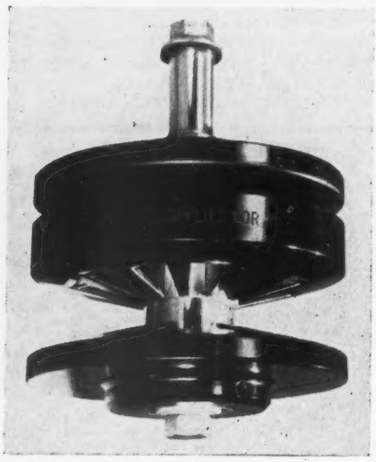
What's New in Equipment

Control

Type S400A "Stokertimer," for use with coal burners or stokers, is driven by a synchronous motor, can be adjusted to give stoker "on" periods at hourly or half hourly intervals. Connection terminals are arranged to permit a separate load circuit if desired. A line voltage device, the timer is used with line-voltage controllers. Minneapolis-Honeywell Regulator Co., Minneapolis.

Variable-Speed Pulleys

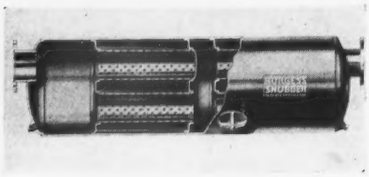
"Speedmaster" variable-speed pulleys having 6:1 up to 40:1 ratios are available



in 2 sizes: a 3½-in. diameter size for drives up to ½-hp. capacity, and a 6½-in. diameter size for drives up to 3-hp. capacity. They are made of molded plastic, trued and balanced before assembly. Pressure-lubricated bronze sleeve allows the splined center sheave member to operate freely. Pulley is adaptable to both straight-line and angular drives. Pulley's position between motor and driven unit is changeable, the variable pulley faces allowing the belts to assume smaller or larger operating pitch diameters. Handwheel gives speed control within 1 r.p.m. Continental Machine Specialties, Inc., 1301-5 Washington Ave., South, Minneapolis.

Air Circuit Breakers

Capable of interrupting peak currents of more than 200,000 amp. at voltages of 440-600, these breakers have interrupting devices for minimizing the formation of arc flame and gases during operation. They are said to limit arcing time to ½ cycle or less, and total operating time is between ½ and 3 cycles. Other features are: deionizing arc interrupter for a.c. and d.c.; refractory metal arcing contacts; silver-faced, solid copper main contacts. Westinghouse Electric & Mfg. Co., East Pittsburgh.

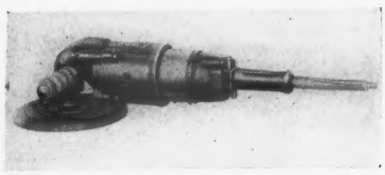


Exhaust Snubber

"Burgess Snubber," non-acoustic noise-quieting device that can be placed at any point in the intake or exhaust system of an engine or compressor, eliminates the noise resulting from the sudden impact of the slug of vented gas with the atmosphere, and also stops the inrush of air into the exhaust pipe after the discharge of the slug. The peak velocities and pressures are "snubbed" thereby producing a smooth flow of gas. The snubbers are available in a wide range of sizes for standard, heavy-duty, and spark-arresting service. Acoustic Div., Burgess Battery Co., 500 West Huron St., Chicago.

Gas Washer

Washer-scrubbers scrub, wash, and neutralize gases and vapors. The "Master" unit handles vapors and gases originating from the manufacture or processing of materials and products in the natural gas, asphalt, oil, chemical, and other industries. Also eliminates pollution caused from discharged solids and air contamination from sewerage gases, digester gases in paper mills, and the like. The units are built on order to fit individual requirements. Master Separator & Valve Co., 607 South Hill St., Los Angeles.



Sander

Two-speed 7- and 9-in sanders have electrical "finger-tip" gear shifting that eliminates mistakes in setting operating speeds. Available in standard- and heavy-duty types, the sanders are semi-inclosed, fan-cooled, with spiral bevel gearing and double-sealed external bearings. Operating on 11 and 220 volts, they are available on order for 32 and 250 volts. Made in single-speed models also. Chicago Pneumatic Tool Co., 6 East 44th St., New York.

Fluorescent Lamp Units

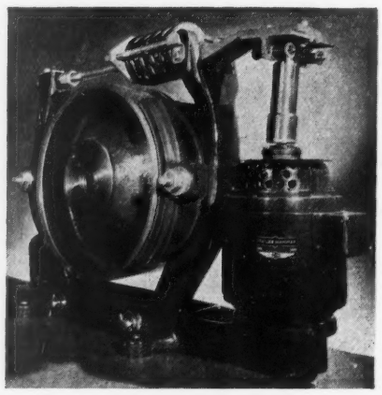
"Flur-O-Line" unit - section - reflector-type, single-tube fluorsecent lamp fixture is self-contained; it may be used as a single lamp, or several units may be assembled to form large sections for use over assembly lines or inspection benches. Its detachable wiring channel houses auxiliaries, conceals the wiring, and makes possible end-to-end or side-by-side attachment of units. Reflectors are of polished aluminum. The units are available for 18-, 24-, and 36-in. lamps, and can be supplied with or without auxilairies. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Tools

"Duplex Handjack and Pointer Driver," for removing and resetting the pointers or hands on pressure gages, comes in a metal box smaller than a cigarette case. The handjack fits the pointers on all indicating gages from 2- to 16-in. dial size. One side is for small pointers, the other for larger ones. The pointer driver is for resetting the pointers. Heavily nickel-plated, the flat sides of the handjack may be used as a light hammer for tapping the pointer on the pinion shaft without damaging the pointer, pinion shaft, or dial. Marshalltown Mfg. Co., Marshalltown, Iowa.

Brake

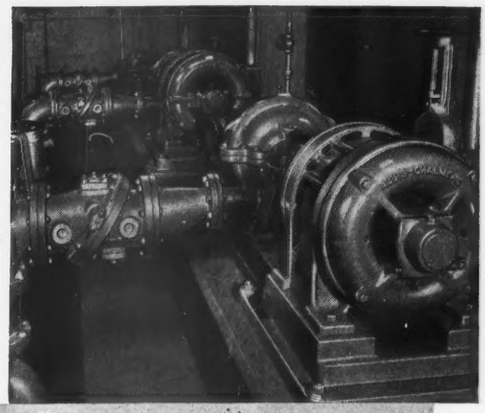
Adjustable a.c. torque-motor-operated brake for service on elevators, cranes, hoists, and like installations, where posi-



tive, "cushioned" braking is required for stopping or holding a load. The motor, operating through an anti-friction ball jack, releases the brake; a helical torque spring sets it; flywheel action of the rotor "cushions" the braking. Some of the features are: large lining area resulting in low unit area pressure and long lining life; individual shoe adjustment; hardened manganese nickel wheel giving true braking surface; hardened steel pins

. . . HOW A MICHIGAN CITY GOT MORE WATER AT LESS COST!

Read How Allis-Chalmers Pumps Solved a Serious Problem at Marysville, Michigan . . . Provided Enough Capacity for Years to Come . . . At a Pumping Cost of Only a Little More Than 1½c Per 1000 Gallons! Find Out How You Can Solve Your Pumping Problems . . . with the Equipment That Pays for Itself!



TO ATTRACT NEW industries, a city needs plenty of water . . . that's why Mayor Edward C. Guck of Marysville, Michigan, is proud of their new pumping plant—designed by Pate & Hirn . . . with Allis-Chalmers pumps giving low costs and big capacity for future growth!

How to increase pumping capacity without increasing pumping costs . . . that's the problem of many growing industrial towns! That was the problem the city of Marysville, Michigan, met and solved . . . with Allis-Chalmers Centrifugal Pumps!

Formerly, pumping costs in Marysville were excessive . . . and covered only booster pumping of limited supplies of raw water. Then, suddenly the picture changed—a large corporation established a new plant in the city. That's when the city of Marysville knew they had to do something to provide more water . . . economically!

More water at less cost is what they wanted . . . and what they got! For when they built their new plant in 1938, they installed new high-speed, high efficiency Allis-Chalmers Centrifugal Pumps on the job. And when they figured up their costs, they found they had a sensationally new low cost of $0.0156 per 1,000 gallons, a figure any city can be proud of!

Allis-Chalmers Pumps Cut Costs!

Today, Marysville boasts a completely modern plant, allowing an extremely wide margin for fire protection and future growth . . . strong appeals to attract new industries . . . and it costs them hardly more than 1½c per 1,000 gallons. That's important news to every city or plant that wants more water capacity at less cost!

If you want to increase your pumping capacity . . . decrease your pumping costs—learn how you can do it with Allis-Chalmers Centrifugal Pumps . . . the equipment that is helping hundreds of municipalities and industrial plants to show amazingly low costs for water handling!

Get the story of the Equipment that Pays for Itself! Write to Allis-Chalmers. Or better yet — there's a trained pump man in the Allis-Chalmers district office near you whose job it is to help solve your pumping problems . . . get better pumping efficiencies for you . . . cut your costs! Why not call him in today for a study of your problems?

1022

CENTRIFUGAL PUMP DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

SINGLE-STAGE DOUBLE-SUCTION PUMPS • CLOSE-COUPLED SINGLE-STAGE SSUnit PUMPS • MULTI-STAGE PUMPS • PAPER STOCK PUMPS • MIXED FLOW AND AXIAL FLOW PUMPS • AND SPECIAL DESIGNS FOR UNUSUAL APPLICATIONS

and bushings. Available in five sizes providing maximum torque ratings of 160, 400, 800, 1,600 and 3,200 ft.-lb. on intermittent duty. Operates on all commercial frequencies and voltages. Cutler-Hammer, Inc., Milwaukee.

Valve Positioner

For use on diaphragm control valves to overcome the effect of friction in the valve stem and top, and on air-operated control installations where close control is necessary and where there is process lag. The positioner insures valve stem travel in proportion to change in the pressure of the air from the controller. The Bristol Co., Waterbury, Conn.

Lathe

The "Metal Worker" is a back-geared, screw-cutting, precision lathe for small shops and toolrooms. It has a 10⅛-in. swing, center distances of either 20 or 26 in., bed lengths of 38 and 44 in. respectively. Other features are: hob-cut, semi-steel change gears, over-size hardened steel spindle, ground all over with 1⅛-in. hole through its length; heavy, semi-steel base with hand-scraped ways —2 V-ways and 2 flat ways. Available in bench and floor models. Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago.

Rod Packing

Rod packing that gives long service on severe jobs employs two metal rings as the sealing medium on the shaft. This construction provides a floating seal. For some applications the rings are of babbitt metal; for others a metal, heat resistant up to 700 deg. F., is used. Between the sets of rings are neoprene rings that have beryllium copper springs embedded in the rubber or neoprene. Springs are self-seating and serve a double purpose: they prevent packing on centrifugal units from turning with the rod; they exert an inward and downward pressure where the packing is used on reciprocating rods. They also compensate for low follower heads, up-and-down motion or side sway. Rodpak Mfg. Co., San Francisco.

Jacks

Principal sizes of the "Simplex" screw jacks feature malleable iron bases. Though light in weight, they are able to withstand rough treatment. A peep-hole in the base makes it possible to see how far the screw can be run out. The floating cap rests on a chrome-molybdenum steel ball and is said to have a 9 per cent float which centers the load. Templeton, Kenly & Co., 1020 South Central St., Chicago.

Overhead Lockers

Superstructure of steel supports locker cubicles that store employees' clothing above the working floor. Combination clothes pan and panel is suspended with chains and pulls that permit lowering and raising of the locker unit. Chains may be padlocked to insure privacy. Each unit, consisting of a pan 2½ in. deep to hold hat and small articles, and a panel with hooks on either side for clothing, will accommodate one or two persons. In case of fire, three fusible links on each locker unit permit the unit to drop to the floor. A bench and a clothes rack are built as one assembly. The installation may be dismantled and moved. Available as single-faced units of 3 rows of 6—18 lockers in all, and as double-faced units of 6 rows of 6—36 lockers in all. Lyon Metal Products, Inc., Aurora, Ill.

Battery Charger Control

Model MP unit automatically controls

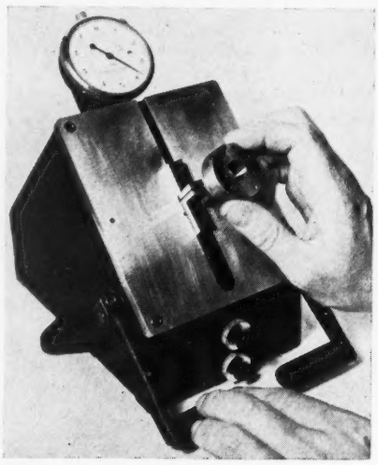
recharging of electric truck storage batteries. The unit consists of a metal case approximately 11x10x5 in., housing inverse temperature-compensated voltage relay, synchronous motor-driven time switch, auxiliary relay, two signal lamps, and connection terminals. Mounted on the charging panel and connected to the charging circuit controls, the unit begins recharging the battery as soon as the charging plug is inserted and the control knob is reset. A white signal light lights up while the battery is being charged. When the charge is completed, the white light goes out and a green one goes on. The lights, together with a reset dial, and instruction plate are on the door of the case. The Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia.

Wrenches

Drop forged of chrome-vanadium steel, "TuType" wrenches combine an open-end and a box wrench with openings ranging from ⅜ to 1 7/16 in. The box end has a double-hexagon opening, offset at 15 deg.; the open end is angled at 15 deg. Finished with chrome plate and polished heads. Adaptable to work on carburetors, generators, manifold, clutch, and starter work, general service on trucks and industrial machinery. Bonney Forge & Tool Works, Allentown, Pa.

Gage

Model 36B-6 internal and external comparator with adjustable contact pressure, checks inside diameters of small holes,

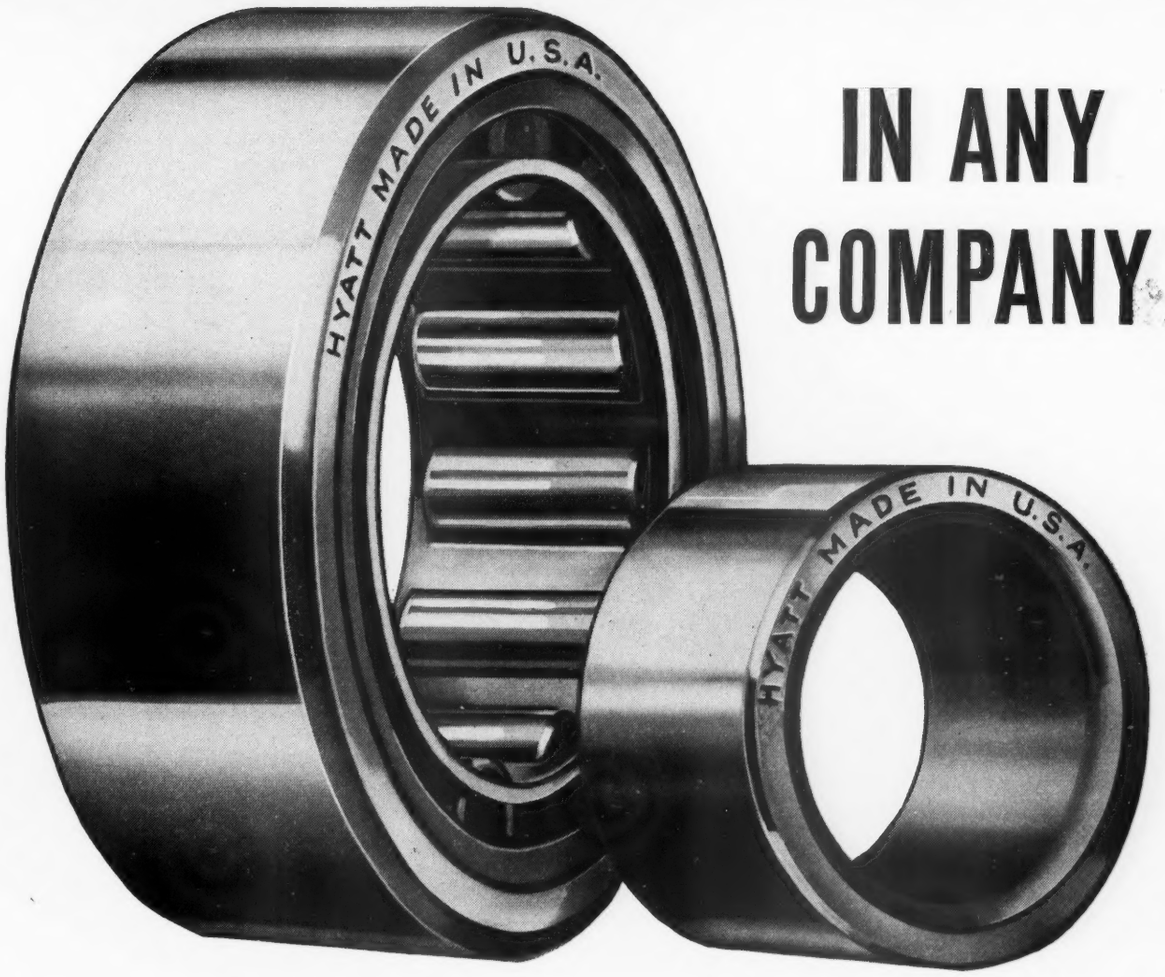


and outside diameters of small parts, for size, out-of-roundness, taper, and bell mouth to less than 0.0001 in. Mounting of measuring contact point provides for sensitivity of instrument, and for easy adjustment of contact pressure to definite, required amounts. Three basic methods of measurement are 2-adjustment contact, triangular 3-point adjustment, and direct-diameter 3-point contact. Plates and contact jaws are interchangeable. Contact jaws measure inside diameters ranging between 0.375 and 3.375 in., and outside sizes up to 2.625 in. Federal Products Corp., 1144 Eddy St., Providence, R. I.

Transformers

Two weatherproof transformers, one for outdoors and one for indoors, for use with high-intensity mercury lamps, are assembled in heavy, one-piece, drawn,

Good Mixers



IN ANY COMPANY

While men may be known by the company they keep, Hyatts are known by the equipment they help keep running. In mine and factory, on the farm, on railways and highways—everywhere—Hyatt Roller Bearings serve and save. For nearly fifty years these dependable bearings have helped make machinery operate more accurately, efficiently, and enduringly. Get better acquainted with Hyatts. You'll find them good mixers in any company, on any job, at any time. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey; San Francisco. Hyatt Roller Bearing Sales Company, Chicago and Pittsburgh.

HYATT *Roller Bearings*

The Weather Stays OUT!

...In The Stratosphere

Climbing miles into the Arctic cold of the stratosphere! Yet the pilot is safe and comfortable —*sealed* in his protective covering. . . .

. . . And During Shipment

Where the elements are *dangerous,* they must be shut out! That's why all AP Abrasives are delivered *sealed* in the sturdy, protecting "Masterpak"!

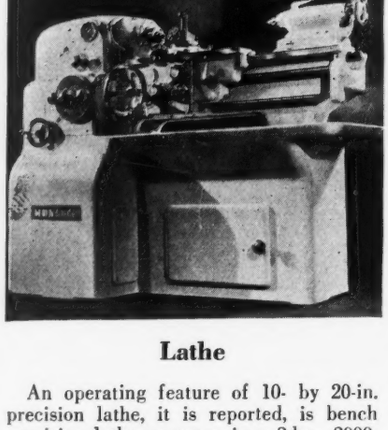
Impervious to moisture and dirt, armored against hard knocks, "Masterpak" delivers its contents to you factory-fresh, crisp and clean — without torn edges, damaged corners, or limpness caused by moisture.

Add to "Masterpak" such AP advantages as those listed below, and you'll understand why thousands of users are finding it *profitable* to specify "AP." If you're still a skeptic, ask your jobber about AP's Free Trial Offer that lets you see for yourself — without obligation. Abrasive Products, Inc., 519 Pearl Street, South Braintree, Massachusetts.

Specify "AP" for These Advantages:
"MASTERPAK" Containers
• 48-Hour Action On ALL Orders
• Authoritative Technical Counsel
• Complete Line—Over 2,000 Items.

ABRASIVE PRODUCTS INC.
JEWELOX • JEWEL EMERY • JEWEL GARNET
JEWELITE • JEWEL FLINT • NEW PROCESS

copper-bearing, weather-resistant steel cases filled with a high-dielectric waterproof compound of considerable heat conductivity. When using a pole-type transformer with lamp-fixture mounting support, the connections may be made at the mast head adjacent to the mercury lamp, thereby making the transformers adaptable to old installations. Jefferson Electric Co., Bellwood, Ill.



Lathe

An operating feature of 10- by 20-in. precision lathe, it is reported, is bench precision lathe accuracy in a 2-hp., 2000-lb., small toolroom lathe. Has wide range of gearless, stepless spindle speeds—forward and reverse; wide range of threads and feeds through inclosed gear box which is operated by one hand; 5 self-aligning ball bearings mounted on eccentric studs to secure carriage alignment; anti-friction bearings throughout; endless belt automatically used for feeds from spindle to gear box, reserving gear train solely for thread chasing. Operating steel parts are made of nickel alloy steel, electric furnace hardened. The Monarch Machine Tool Co., Sidney, Ohio.

Lamp Control Units

Control units designed to maintain proper current and voltage for tubular fluorescent lamps are available in 18- to 36-in. sizes, 110-240 volts. Made for a.c., 60 cycles only, but can be supplied on order for 50-cycle operation. Units are built complete in a compound-filled case, including a thermal switch for starting, a reactor or transformer to provide proper current and voltage, and a small capacitor to eliminate radio interference. May be mounted in almost any standard wireway; standard mounting lugs also permit mounting in other locations. Primarily an inside unit; outside use necessitates protection from weather. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Undershoes

"Tirex" undershoes provide insulation against hot, cold, hard, and wet floors. They are made of over ½-in. heavy rubber and cord fabric combined, and are put together with rust-proof steel wire and zinc accessories, yet are light in weight. They aim to reduce fatigue and to eliminate slipping on wet or greasy floors. Available in sizes 5-12, and in a 9½-in. length for women. Tirex Mat Co., Inc., 3045 Broad Creek Road, Norfolk, Va.

(Continued on page 94)

TEMPERATURE LOWERED 15°

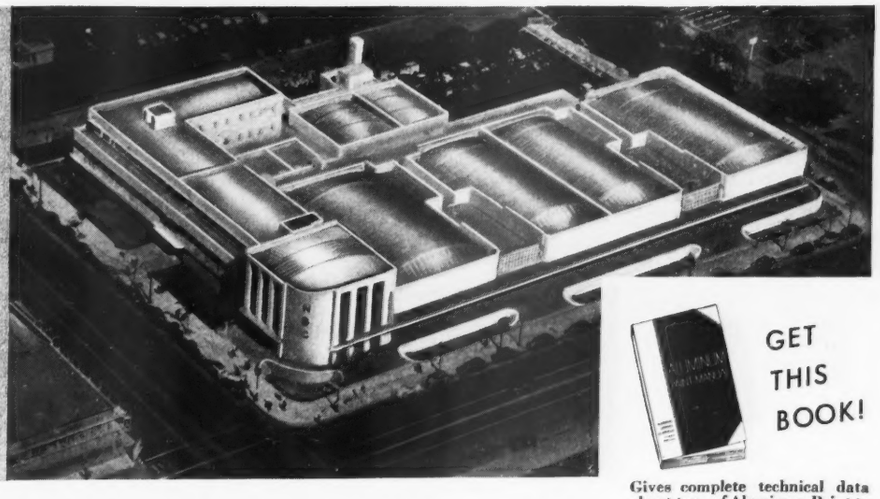
with Aluminum Paint

United Sash & Door Company, Wichita, Kansas, first painted only the two roofs at right in picture. In August the temperature on the third floor of this section was 15° lower than in adjoining section having the same roof structure unpainted. Thereupon all roofs of the plant were painted with Aluminum Paint.

Aluminum Paint Increases Air Conditioning Efficiency of HOLLYWOOD RADIO CITY!

Painted with Aluminum Paint, the roofs of Hollywood Radio City flash in the sunlight, a landmark for aviators.

For NBC, the sunlight reflection means more efficient operation of air conditioning equipment. Also, by repelling heat waves, Aluminum Paint greatly lengthens the life of roofing.



GET THIS BOOK!

Gives complete technical data about type of Aluminum Paint to use for roofs and other surfaces. Write ALUMINUM COMPANY OF AMERICA*, 2126 Gulf Building, Pittsburgh, Pa.

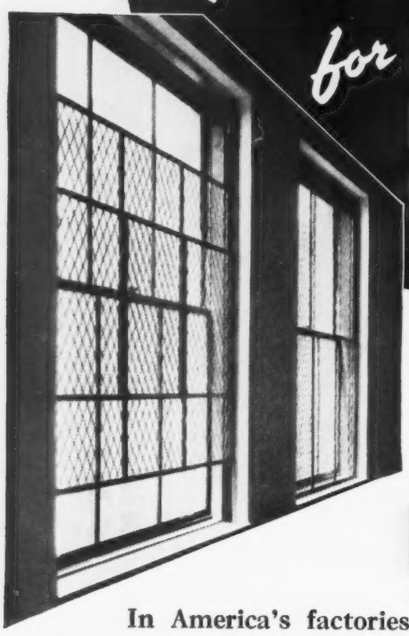
Reg. U. S. Pat. Off.
ALCOA ALUMINUM
ALBRON *Paste for*

**We make no Aluminum Paint: only Alcoa Albron Paste and Powder, the pure Aluminum pigments you get in leading brands of Aluminum Paint.*

ALUMINUM PAINT

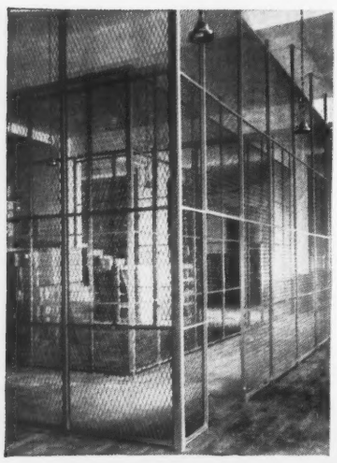
Use Steelcrete

Expanded Metal for GUARDS PARTITIONS SHELVING



FIRE-PROOF EASILY FABRICATED

In America's factories, Steelcrete Expanded Metal serves many purposes. This fire-proof, open mesh material can be made economically into window guards, partitions, shelving, trays, baskets, machine guards and countless products. It is available in 2 styles—Safe-T-Mesh for use where rigidity and strength are important and in Flattened Mesh for articles in which a smooth surface is needed such as shelving, display units and baskets. Available in various gauges and sizes.



Write the nearest office for complete details and a copy of the Steelcrete handbook which describes many uses for Expanded Metal.

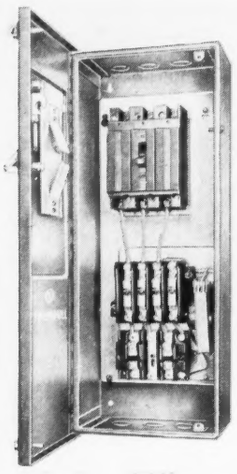
THE CONSOLIDATED EXPANDED METAL COMPANIES
WHEELING, WEST VIRGINIA
Branch Offices and Warehouses:
New York • Chicago • Detroit • Cleveland • Pittsburgh • Philadelphia • Boston • Buffalo • Houston • Atlanta
Export Office: 330 West 42nd St., New York, N. Y.

Electric Hoist

"Speedway" light-weight, wire-rope hoist has hoisting capacities 250-750 lb., hoisting speeds 15-43 ft. per min. Construction includes inclosed ball-bearing motor, anti-friction bearings, cut alloy steel spur gears, multiple disk solenoid brake, pushbutton control, preformed hoisting cable. Made in three types for lug suspension, hook suspension, or mounted on trolley. Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

Starters and Switches

Combination magnetic starters and circuit breakers are available in 0-25 hp. control range at 110–550 volts a.c. Type C inclosed switches come in 30- and 60-amp. capacities. They are assembled on heavy porcelain bases in a compact design that gives ample wiring room. Type D inclosed switches in the 60-amp. size have individual poles on heavy porcelain, equipped with wire clamps, and finished in baked aluminum. The Trumbull Electric Mfg. Co., Plainville, Conn.



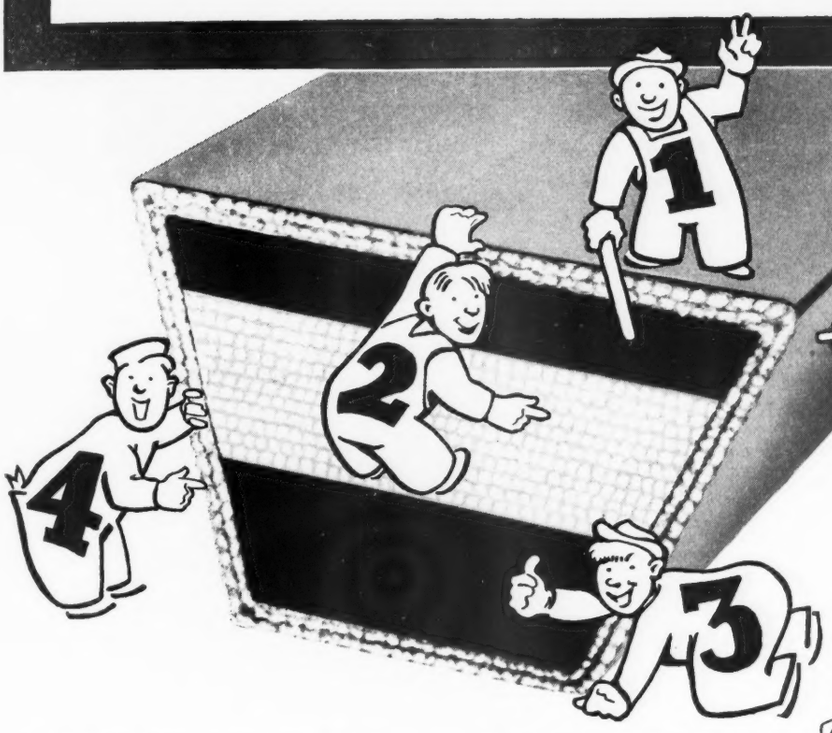
Pressure Gage

A power-type pressure gage for measuring high pressures with a maximum range of 10,000-12,000 lb. per sq. in. is claimed to be accurate to 1/10 of 1 per cent of the reading. For each pressure applied to a small rotating pressure piston, a definite position of the power piston, mercury cup, and indicating pointer is obtained, thus giving the indicator pressure reading. The gage can transmit readings to indicators and recorders located at distant points. The calibrated range remains constant at 2,000 lb. Amount of suppression may be decreased in 1,000-lb. steps by the removal of weights. Bailey Meter Co., 1050 Ivanhoe Road, Cleveland.

Flexible Couplings

"Bondtru" coupling, adaptable to practically any application, transmits up to 100 hp. at 100 r.p.m. The five intermedi-

MEET THE *Gilmer* GANG* AND FORGET YOUR V-BELT PROBLEM!



* Now operating in the 48 States and in 64 Countries.

● Whether you read this in Boston or Buffalo, Oklahoma City or Oakland . . . you are only as far away from this hard-hitting crew of trouble-shooters as you are from your telephone.

That's a good thing to remember when you're ready to put The Gilmer Gang to work for you. The Gilmer Gang gives you *better service* on every unit in your plant . . . whether a multiple drive or the smallest f. h. p. with

GILMER "PRECISION-PLUS" V-BELTS
that meet all service demands of the toughest installations!

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TACONY · PHILADELPHIA

THE OLDEST FIRM OF RUBBER FABRIC BELT SPECIALISTS

Factory Branches and Warehouses: Atlanta, Ga., 95 Pine Street . . . Chicago, Ill., 351 E. Ohio Street . . . Houston, Texas, 1015 N. San Jacinto Street . . . New York, N. Y., 50 Church Street . . . Newark, N. J., 115 Edison Place . . . San Francisco, Cal., 510 Bryant Street . . . Seattle, Wash., 307 Maritime Building . . . Tulsa, Okla., 802 Archer Street

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These Famous 5 Features for Multiple Drives

Gilmer **Top Tension Rubber**—Tough, resilient. Cuts out costly misfits.

Gilmer **Rubber-locked Pulling Cords**—Patented construction, concentrating brute strength in thin section, makes cords ride parallel, without twisting, under pressure.

Gilmer **Heat-resisting Bottom Rubber**—Specially developed by Gilmer engineers to insure cool running at high speeds and eliminate "squashing" in the groove.

Gilmer **Double Jackets**—Protect the belt's vital working parts from oil, dirt, and grease, making Gilmers last three times as long.

Gilmer **Controlled Stretch**—Pre-tested, to guarantee permanently matched working lengths on every job.

● **Get the "Precision-Plus" V-Belt you need . . . *and get it fast* . . . from The Gilmer Gang right nearby. Send *today* for the FREE Gilmer V-Belt Catalogue.**

The ANSWER

to TROUBLE-FREE SHORT CENTER DRIVES

is Controlled Belt Tension

Establishing belt tension at the maximum required to carry starting and other infrequent peak loads causes much short center drive difficulty. Motor loads vary widely . . . and belt tension should be controlled to vary with the load. Too much belt tension imposes a costly burden on belts and bearings . . . too little tension causes belt slip and loss of production.

The *only* method for providing ideal belt tension, automatically matched to changing loads, is the American Tension Control Motor Base. It provides correct belt tension at all times, under all loads, to operate either flat or V-belt drives at highest efficiency.

American engineers are available to demonstrate in your own plant the savings this equipment makes possible.

THE AMERICAN PULLEY COMPANY
Dept. 2, 4200 Wissahickon Avenue
PHILADELPHIA, PA.

AMERICAN
Tension Control
MOTOR BASE

ate sizes with over-all length from $3\frac{3}{8}$ to $7\frac{5}{16}$ in. have been redesigned for inserts with six radiating arms, providing three driving points of contact, thus increasing load-bearing surface of insert.

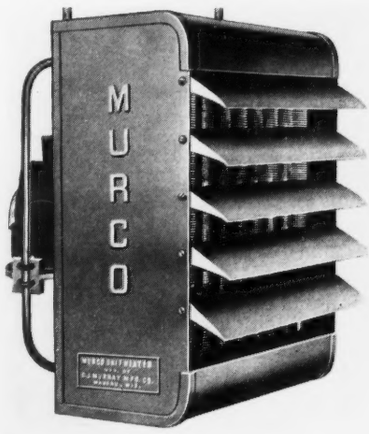
Size B-11, 0.25 hp., is available in 38 lengths: $1\frac{9}{16}$ to $5\frac{1}{8}$ in. in combinations of various length flanges, the longer couplings having one or two Bakelite extensions added. Special forms can be supplied upon order. Charles Bond Co., 617-623 Arch St., Philadelphia.

Hoists

Two-speed a.c. hoists give slow speeds for starting, inching, running and stopping, and fast speeds for rapid handling. Suitable for applications requiring gradual starting and stopping. Built in capacities $\frac{1}{4}$–6 tons. Squirrel-cage motors are equipped with ball bearings and are attached to the hoist frame. The hoists have worm drive with worm and wheel running on roller bearing and operating in a bath of oil. Hoists have close headroom and are built in single- and twin-hook types; also, safety type hook blocks with guards inclosing the bottom sheaves. Control may be by either rope or push button. Rope guides for side and end pulling, and top and bottom limit switches can be had. Electro Lift, Inc., 30 Church St., New York.

Unit Heater

"Murco" unit heater comes in 25 models, B.t.u. ratings ranging 20,600-



556,000, and delivery 430-8,600 cu. ft. per min. Heating elements are copper tubes expanded into high-test, alloy cast iron headers. The condenser is attached to the casing by a special spring support

(Continued on page 100)

CLEANER BOILERS WITH HALF THE OIL

● WET STEAM and the high mineral content of the boiler water made lubrication of the steam engine in a Missouri power plant a real test for any oil. In addition oil carry-over made it necessary to skim the boilers daily.

After replacing the valves and piston and reboring the cylinder on this engine, a test was made of various oils. Could one be found that would reduce consumption and oil carry-over to the boilers and, at the same time, give adequate lubrication?

When StanoCyl W was tried, it was found that oil feeds could be cut to nine drops per minute—just *half* the former oil consumption. This small amount of StanoCyl provided ample lubrication, and practically eliminated oil carry-over and boiler trouble.

There's a grade of StanoCyl for every steam condition. StanoCyl W for wet steam, StanoCyl D for dry steam, and SH for superheated steam. Let a Standard Lubrication Engineer test the right grade in your engine. It costs you nothing and it may show you how to save up to *half* of your present oil consumption.

Copr. 1939, Standard Oil Co. (Ind.)

STANOCYL
STEAM CYLINDER OIL

STANDARD OIL COMPANY (INDIANA)

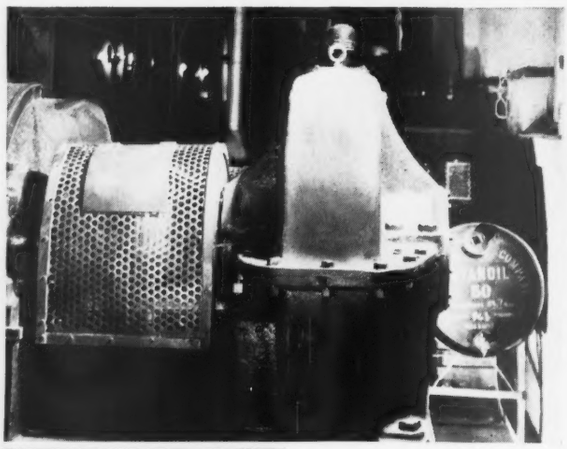
...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT

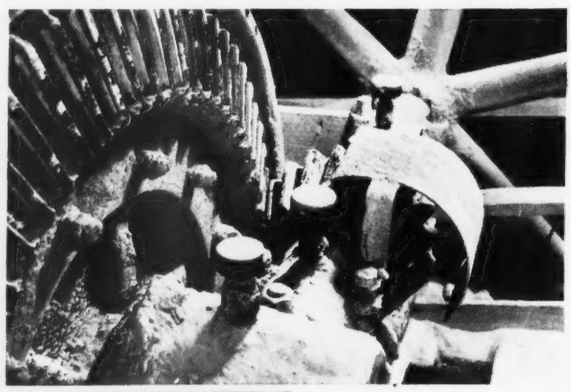
NEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT

NO OIL CHANGE IN 25 YEARS

● PROOF that high quality oil and care in handling it can make spectacularly low lubricating cost records. These 10,000 HP Hydro-turbines were filled with Standard's Turbine Oil when installed in 1913. The oil has been tested regularly, centrifuged periodically, and about one half of one per cent of make up oil added monthly. Because of this care and the natural quality of the oil it has *never been changed.*

Interior of the Mississippi River Power Company plant at Keokuk Dam showing line of 15-10,000 HP turbines lubricated with Standard's Turbine Oil since their installation 25 years ago.





STANOIL

Fewer oil changes, cleaner gear cases, no clogged oil lines are but a few of the advantages consistently reported by users of Standard's New Stanoil. That's not a coincidence. Stanoils are *made*, purposely, to avoid these lubricating troubles. High resistance to oxidation is the secret. Make your next fill of oil in a motor, gear reduction unit or circulating system, Stanoil. Let it prove these claims.

SUPERLA GREASE

In the tough spots—in dusty, gritty, quarry operation, in the high temperature service of cement mills or the water flooded conditions of various processes—Superla Greases have been tried and reordered by operating men in all types of industries. Reduced wear or lower consumption is a "natural."

NEW LUBRICATING LITERATURE

Two new informative booklets have recently been released by the Standard Oil Technical Department. They're yours for the asking. "Spare the Time to Spare Your Machines" describes important oil qualities—tells how they are obtained and what they mean to you. It will help you determine the right oil to use on many types of service.

Of particular interest to steam engine operators is the booklet on StanoCyl steam cylinder oil. The oil that has cut consumption, reduced oil carryover and engine wear in almost every application.

Send for these booklets. Write Standard Oil Company (Indiana) 910 S. Michigan Ave., Chicago, Ill.

MAIL THIS COUPON

Standard Oil Company (Indiana)
910 S. Michigan Ave., Chicago, Illinois.

Gentlemen: Please send me the booklets checked below

- ☐ Spare the Time to Spare Your Machines
- ☐ StanoCyl Steam Cylinder Oil

Name .....

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NOW..YOU CAN MAKE your plant processing conform to the technologist's plan ...in everything!

Another feature of BRISTOL'S SYSTEM OF COORDINATED PROCESS CONTROL that helps you end rejects, cut costs, improve quality

After research has determined the one best way of making your product, after the pilot plant has actually turned out the desired product by the method prescribed, then comes the big problem. How are you going to transfer your process from the laboratory to the plant and there put it into operation on a commercial scale? What is your next step to be certain, day after day, of consistently uniform yield, quality, processing time and cost?

This is the responsibility that in an ever growing number of plants is being put up to Bristol's System of Coordinated Process Control. By taking *complete* and *automatic* charge of *all factors* that influence processing—such as temperature or pressure, or the operation of motors, pumps, valves or other mechanical equipment, and by coordinating and interlocking these, one with another, in the proper sequence, at the correct values, in accord with the right time program, Coordinated Process Control relieves your men of all production worries and trouble. Output is uniform, both in quality and quantity.

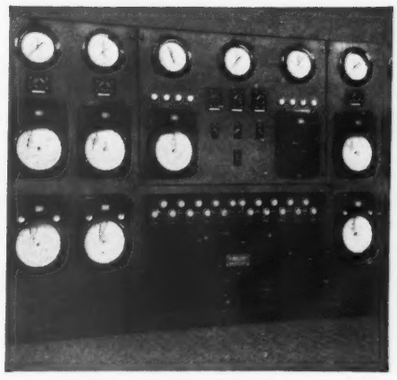
The modern trend in industry, Coordinated Process Control is today showing management how to end rejects, cut production costs, and secure amazing product uniformity. Applicable to widely differing processes, it offers you, too, an opportunity to obtain many worthwhile economies and benefits. Bulletin No. 460-511F, promptly mailed on request, discusses the preliminary details you will want to have on this new guide to greater profits. Write for a copy.

MORE THAN JUST INSTRUMENTS

Bristol's System of Coordinated Process Control is made possible *only by the combination* of (a) the ability, experience and facilities of the Bristol's engineering staff to apply to a given plant problem a simplified layout of modern instruments providing complete coordinated process automaticity, (b) Bristol's Process Cycle Controller, the "mechanical brain" of coordinated process engineering, and (c) the complete line of Bristol's controlling, recording and indicating instruments for pressure, level, temperature, humidity, flow, motion, electrical quantities, etc., —a complete service backed by Bristol's undivided responsibility.

THE BRISTOL COMPANY
WATERBURY, CONNECTICUT

Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Seattle. Canada: The Bristol Company of Canada, Limited, Toronto, Ontario. England: Bristol's Instrument Company, Limited, London, N.W. 10

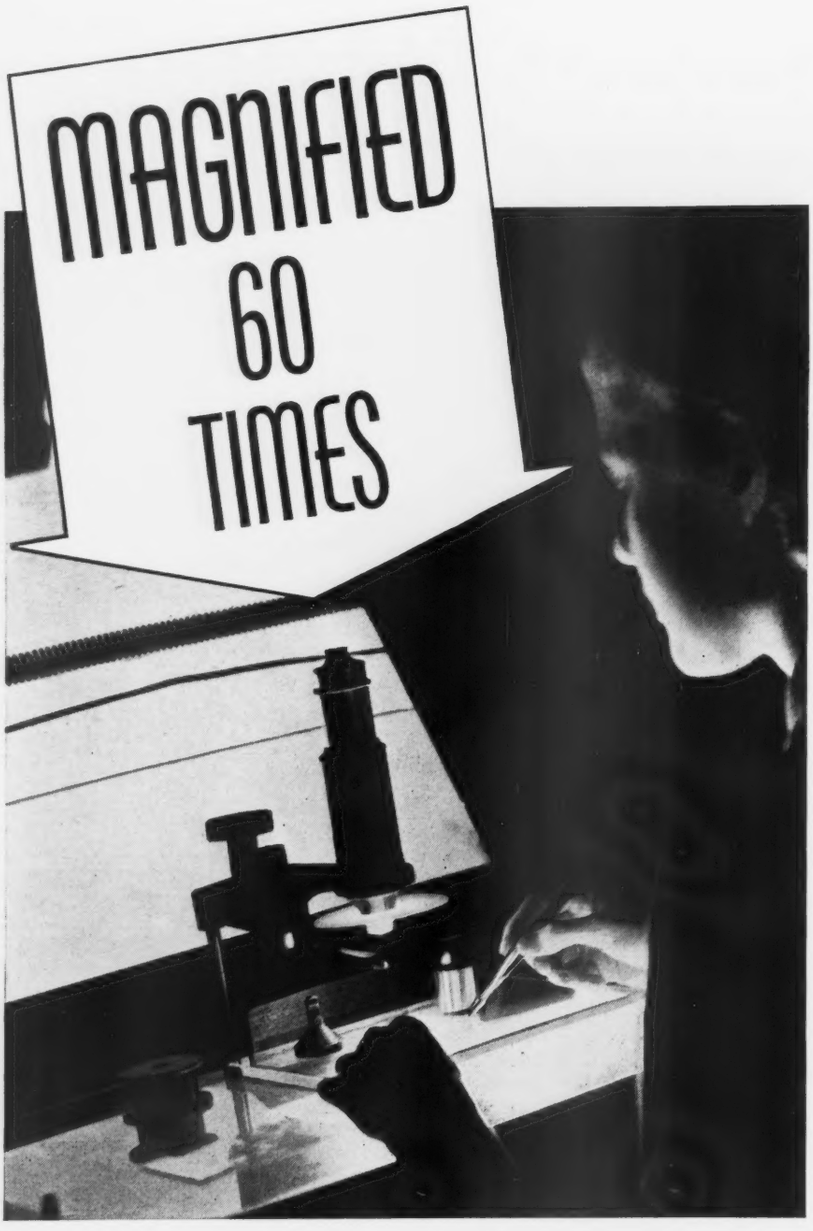


IN WIDE USE TODAY

This modern technique of process control is now being used by some of the most progressive and successful manufacturers in the country.

Bristol's System of COORDINATED PROCESS CONTROL

INDUSTRY'S GUIDE TO A UNIFORM PRODUCT



ONE OF THE REASONS why MAZDA lamps made by General Electric give more light in 1939 is the improved tungsten filament that burns brightly inside the lamp. Finer than a human hair, it is coiled into a tiny spiral, then magnified 60 times for final inspection. Above (top to bottom) a coiled filament, a human hair, an uncoiled filament. When you buy MAZDA lamps made by G-E you are sure of getting the benefit of the latest improvements in lamp bulb manufacture. General Electric Company, Nela Park, Cleveland, Ohio.

THEY STAY BRIGHTER LONGER

GENERAL ELECTRIC
MAZDA LAMPS

(Continued from page 96)

device so that the condenser is full "floating" to overcome contraction and expansion. D. J. Murray Mfg. Co., Wausau, Wis.

Conveyor

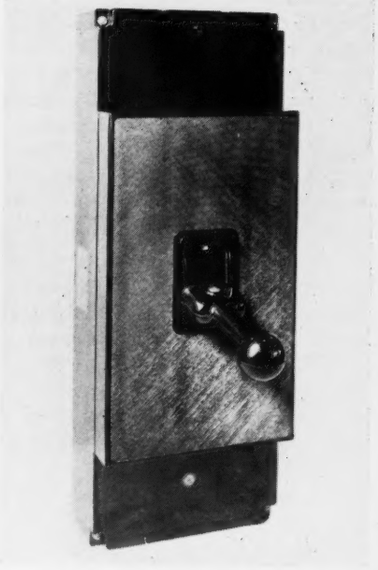
"Port(A-F)low" portable conveyor designed for a variety of changing case-handling problems—moving and loading inside the plant and outside—is adjustable, flexible, light-weight, and strong. The steel angle supports are capable of 6-in. adjustment in height and are equipped with 3-in., ball-bearing, swivel casters. Straight sections and reversible curves are easily joined together. One man can handle a 10-ft. section weighing 68 lb. Integral ball-bearing rollers are independently mounted either straight or staggered every 4 or 8 in. in metal troughs. The angle crossbars and 2- or 3-in. channel side frames are electrically welded. The Alvey-Ferguson Co., Inc., Cincinnati.

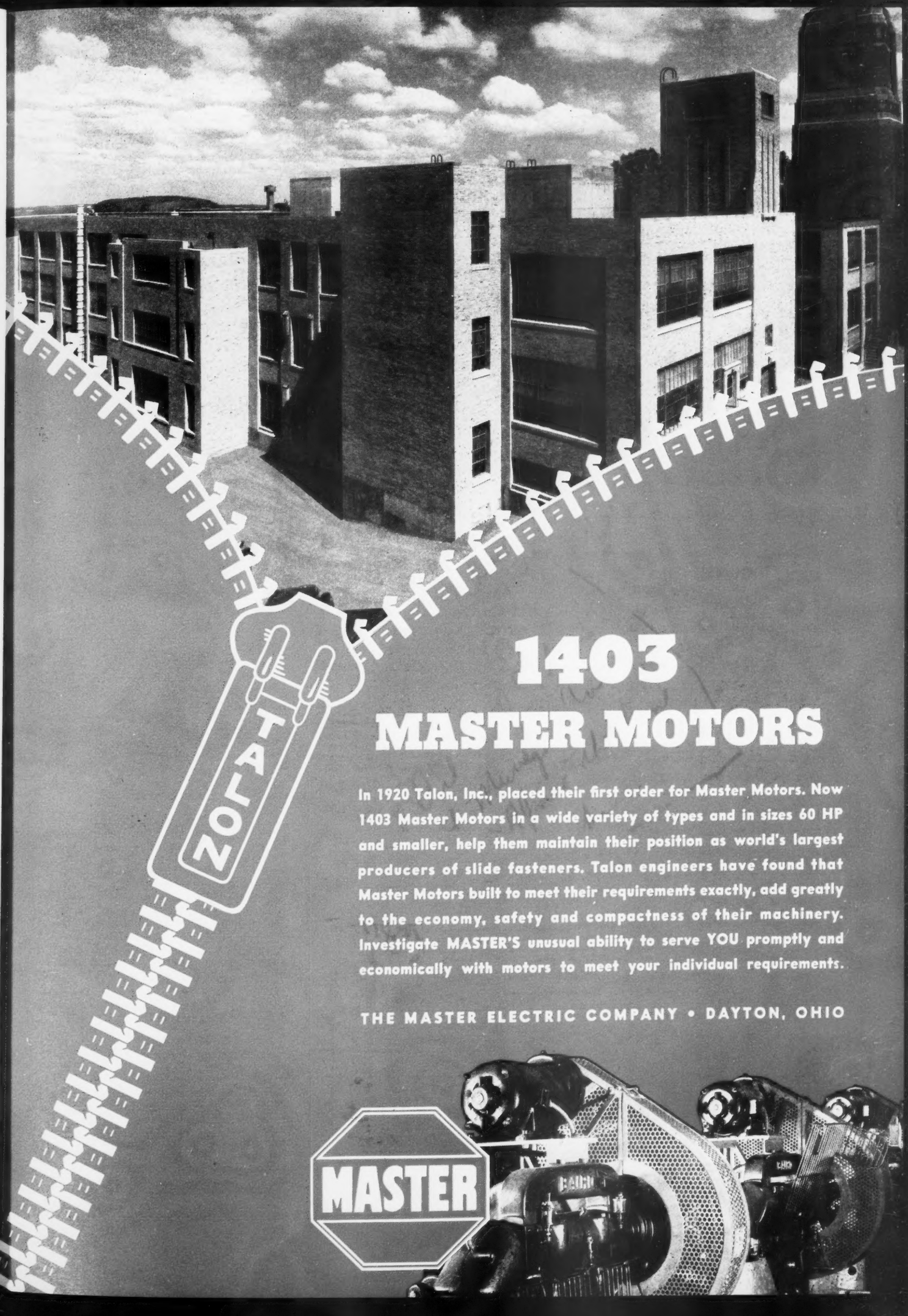
Spring Hammer

Designed primarily as a floor-to-ceiling tool, this spring hammer that drills holes upwards in concrete ceilings may also be used for drilling from scaffolds. The self-drilling shells drill their own holes and then expand in the hole to form a fastening. Shells are available in ⅜- and ½-in. sizes. Equipped with cranks for manual operation, the power-drilling unit is interchangeable with the hand-drilling unit. Phillips Drill Co., 1535 Cortland St., Chicago.

Air Circuit Breaker

Type AB-20 "Deion" air circuit breakers, for protection of main distribution feeders requiring a breaker of 20,000-amp. interrupting capacity, are available in 70- to 600-amp. wire-size ratings, and for voltages up to and including 600 volts a.c., or 250 volts d.c. Silver-alloy contacts assure positive contact, length of life, and protection against "welding" on heavy short circuits. Instantaneous magnetic trips that operate at 9-10 times





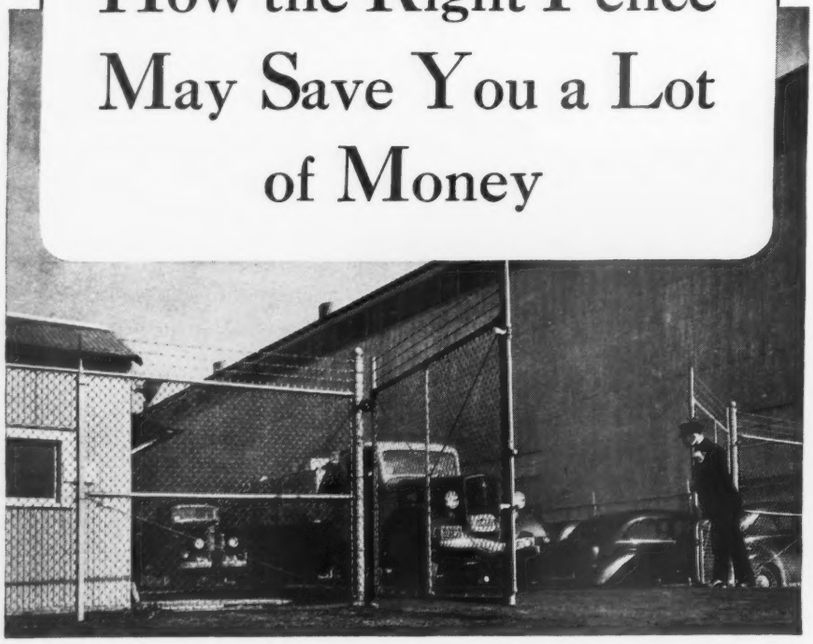
1403
MASTER MOTORS

In 1920 Talon, Inc., placed their first order for Master Motors. Now 1403 Master Motors in a wide variety of types and in sizes 60 HP and smaller, help them maintain their position as world's largest producers of slide fasteners. Talon engineers have found that Master Motors built to meet their requirements exactly, add greatly to the economy, safety and compactness of their machinery. Investigate MASTER'S unusual ability to serve YOU promptly and economically with motors to meet your individual requirements.

THE MASTER ELECTRIC COMPANY • DAYTON, OHIO

MASTER

How the Right Fence May Save You a Lot of Money



WHEN every foot of your property line is guarded night and day with sturdy Cyclone Fence, you can stop worrying about burglars, marauders or firebugs. For Cyclone is respected by those who would carelessly or willfully damage your property. That's why it saves money—pays real dividends on its moderate first cost.

It is important that you get the right fence — erected properly. Cyclone Fence embodies design features that lengthen life and save you money. Posts are strong—mesh is heavily galvanized *after* weaving to assure maximum weather protection —gates prevent rails from buckling. And when installed by Cyclone's factory-trained crew, this fence is sure to maintain its original shape and attractiveness. Upkeep is almost negligible.

What type of chain link fence do you need? How much of it? How high? With barbed wire? What kind of gates? These and many other fence problems will readily be solved for you by our fence engineers with no obligations whatsoever to you. Write us for catalog and a free estimate.

Now you can be sure of the quality of fence before you buy it. Cyclone Fence with the "12M" label has an extra-heavy coat of galvanizing that resists rust and makes the fence last longer. Be sure that the "12M" label is on the fence you buy.

CYCLONE FENCE COMPANY

General Offices: Waukegan, Ill.

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Standard Fence Company, Oakland, California, *Pacific Coast Division*

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Send for FREE 32 page book. **Tells you all about fence. Crammed full of illustrations. This book will help you choose the type of fence best suited to your property —business, school or home. 14 kinds of fence illustrated. Whether you require a few feet or several miles of it, send for this free, informative book. Mail the coupon today.**

USS CYCLONE FENCE

CYCLONE FENCE CO., Dept. 939
Waukegan, Ill.
Please mail me, without obligation, a copy of "Your Fence—How to Choose It—How to Use It."

Name.....

Address.....

City..... *State*.....

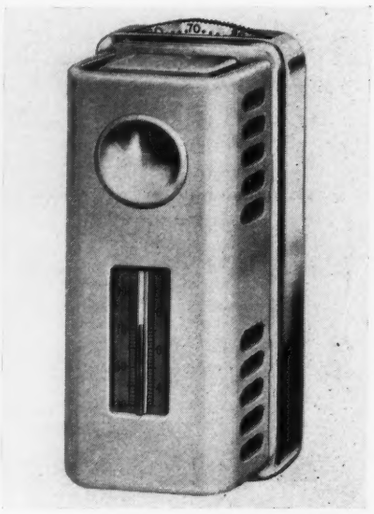
I am interested in fencing: ☐ Industrial Property: ☐ Playground; ☐ Residence; ☐ Estate; ☐ School. Approximately.....feet.

UNITED STATES STEEL

thermal rating supplement the thermal trip elements calibrated with inverse-time characteristics, thus providing instantaneous tripping on short circuits where inverse-time-limit characteristics are not desired. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Thermostat

Features hydraulic action. Applicable for winter heating or for cooling installations, or where heavy load switching ca-



pacity without relays is desired—25 amp. at 120 volts a.c. Element, switch, and live parts are totally inclosed. Incorporates fixed total differential of 2 deg. F., has visible or concealed adjustment, and may be had with or without a thermometer. Other features are positive snap action, integral lead-in for BX or conduit. No outlet box is required. Available in case size 2¾x2¾x6 in. Julien P. Friez & Sons, Inc., Baltimore.

Face Shield

"Protecto-Shield" guards worker's face in light grinding operations, wood working, spot welding, and other occupations. Made of clear, amber, or green transparent cellulose acetate, it permits clear vision without obstruction. It extends back along the sides of the face, fits over eyeglasses, and may be thrown back when not in use. A sweat pad that fits under an adjustable molded rubber headband is provided for comfort. All parts are replaceable. Willson Products, Inc., 242 Thorn St., Reading, Pa.

Electric Belt Sander

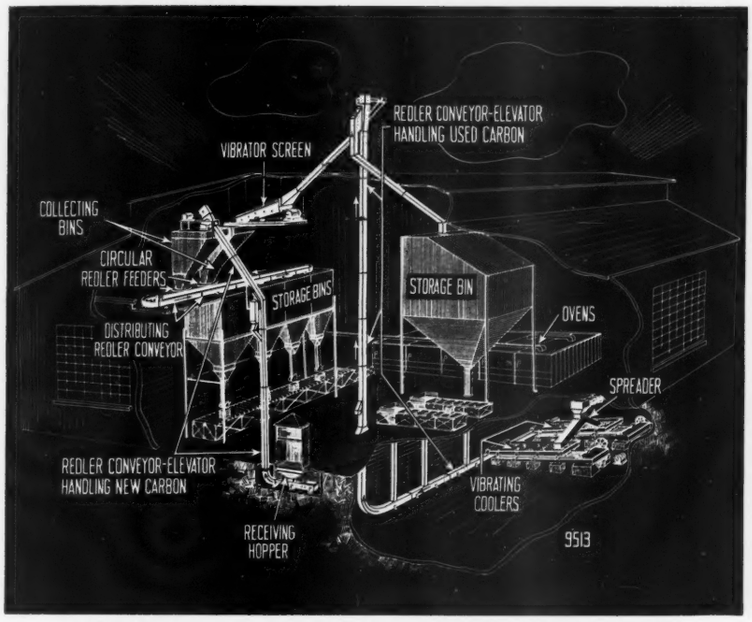
Type A-2 "Guildsander," does various types of sanding on straight and slightly curved surfaces. Besides its use on metal and wood it may also be used on slate, plastics, and composition materials, to polish and hone marble or other minerals, for light grinding on straight-grain metal, and for sharpening hand tools. Built with a die-cast aluminum frame finished in baked aluminum enamel, it weighs 9 lb., and is portable. Endless type abrasive belts travel up to 600 ft.

THE TREND IS TO...

COMBINATION CONVEYING-ELEVATING!

ONE UNIT BOTH CONVEYS AND ELEVATES—

NO DUST—NO FEEDERS—NO BREAKAGE—NEEDS ONLY 1/4 USUAL SPACE



REDLER CARBON HANDLING SYSTEM IN MODERN MOTOR CAR PLANT

In the main plant of one of Detroit's leading motor car manufacturers, this Stephens-Adamson REDLER Conveyor-Elevator system conveys and elevates carbon used to add toughness and wearability to many steel car parts through carbonizing. By turning to the REDLER system, this customer reduced amount of new carbon which had to be added to old carbon, from three parts new for one part old, to only one part new carbon for six parts old . . . because of REDLER'S *en masse conveying-elevating action eliminating breakage.*

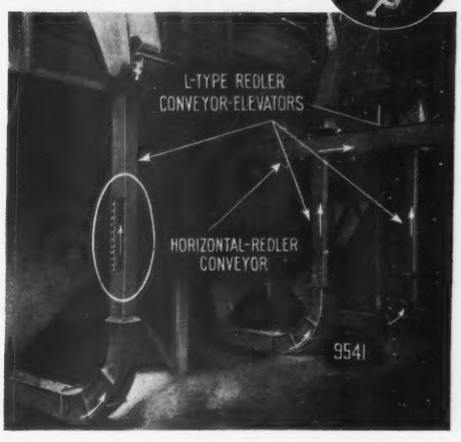
It takes only one single REDLER Conveyor-Elevator to do the work of both a Belt Conveyor and a Bucket Elevator. For the REDLER conveys and elevates any pulverized, granular or small lump material both horizontally and vertically in a single, dust-tight casing.

In fact one single REDLER CONVEYOR-ELEVATOR is often used in place of as many as four ordinary units . . . as in case of Horizontal or Vertical Closed Circuit units, where material is conveyed in one unit in a complete horizontal or vertical circuit.

The compact en masse conveying-elevating action enables you to handle large tonnages in a comparatively small space . . . without breakage of conveyed material. The totally enclosed construction prevents any dust from escaping from casing. And with its choke feed principle of loading, REDLER Conveyor-Elevators eliminate the need of Feeders. WRITE FOR CAT. 42!

HANDLING FULLERS EARTH, CELITE AND CHARCOAL

Each of the three L-type REDLER Conveyor-Elevators shown below convey and elevate one of these three products in required volume to overhead Screw Conveyor which collects and discharges to long horizontal type REDLER Conveyor. Photographed in San Francisco plant of El Dorado Oil Works.



HERE ARE SOME OF THE HUNDREDS OF MATERIALS SUCCESSFULLY HANDLED IN REDLER CONVEYOR-ELEVATORS

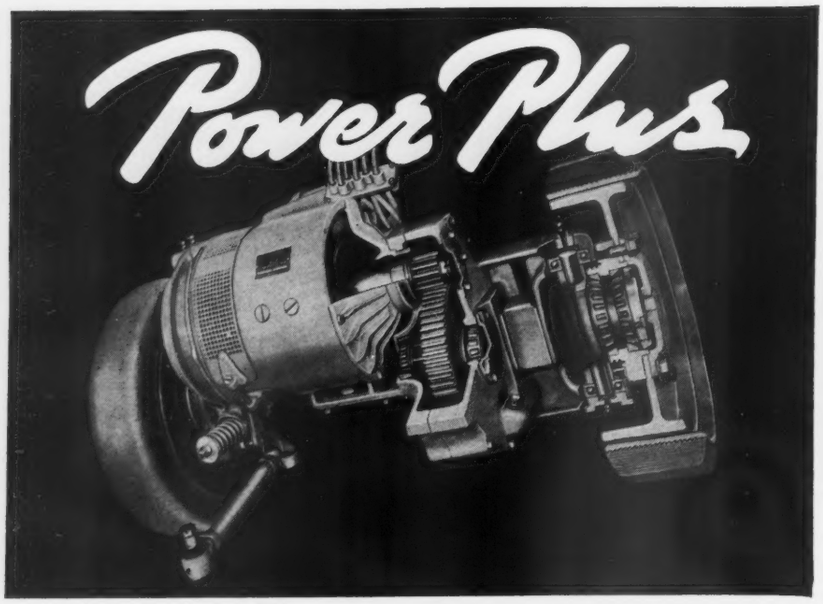
Aluminum Ore Dust	Cocoa Beans	Malt
Aluminum Sulphate	Coffee	Mica Flakes
Barley	Cork	Peanuts
Bauxite	Feeds	Potash
Borax	Fertilizer	Salt
Carbonated Bone	Flaked Cereals	Sawdust
Casein	Flour	Soaked Wheat
Cellulose Acetate	Flue Dust	Soap Chips
Cement	Fly Ash	Soy Beans
Charcoal	Fullers Earth	Starch
Chocolate (powd.)	Kaolin Clay	Sugar
Coal	Lime	Sulphur

Conveying • Elevating • Screening • Transmission Equipment

STEPHENS-ADAMSON MFG. CO.

1 RIDGEWAY AVENUE

LOS ANGELES, CAL. AURORA, ILLINOIS BELLEVILLE, ONTARIO.



. . . ANOTHER YALE EFFICIENCY STORY

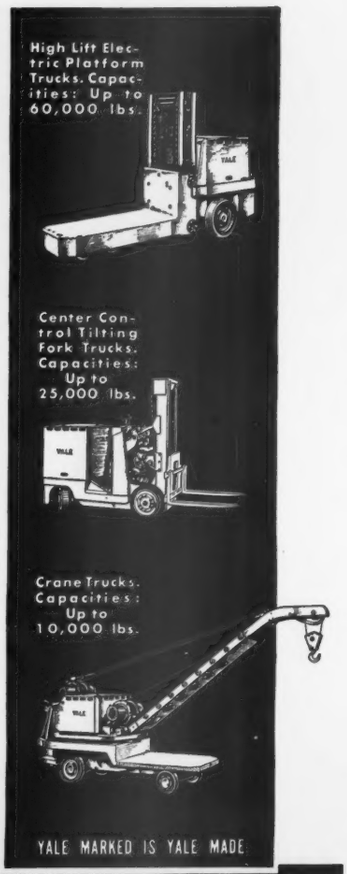
Power Plus—power with maximum operating efficiency resulting in lowest ton miles cost. Something that the Power Axle illustrated above definitely gives.

The heart of every Yale Electric Truck—this sturdy Power Axle is ready to go 24 hours a day. That's why, year in and year out, Yale trucks prove themselves faster—more powerful—more easily maneuverable in every classification of industry.

Thanks to the mechanical advances innovated by Yale, this drive unit offers EXTRA power. Made up of a balanced double reduction of drop forged chrome nickel steel gears that are heat treated and operate in a bath of oil—it provides years of trouble free service.

Power Plus is just one of the reasons that Yale Electric Trucks are first choice with the world's leading industries. There are many others.

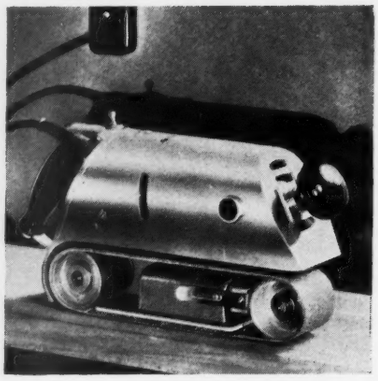
Send for descriptive literature describing the complete Yale line.


High Lift Electric Platform Trucks. Capacities: Up to 60,000 lbs.
Center Control Tilting Fork Trucks. Capacities: Up to 25,000 lbs.
Crane Trucks. Capacities: Up to 10,000 lbs.
YALE MARKED IS YALE MADE

TRADE YALE MARK

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

per min., are 2 in. wide by 21 in. circumference, and are furnished in all usable grits. Equipped with 110-volt universal motor. Syracuse Guildtool Co., 1720 North Salina St., Syracuse, N. Y.



Corrosion Control

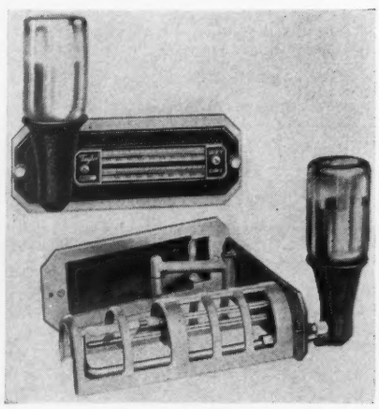
"Co-Res-Co" applied to surface of steel and other metals by spraying, dipping, or brushing protects them against corrosion by atmospheric exposure, salt air and water, dilute acids, acid fumes, alkalies, and like agents. No prime coat is required. It is capable of withstanding a dry heat of more than 600 deg. F., and liquid heat of approximately 150 deg. F. Available in black and olive green. Corrosion Control Corp., 26 Broadway, New York.

Grinding Wheels

"Ever-Tru" grinding and coping wheels have elastic woven-wire mesh of alloy spring steel lying in the center, between the abrasive part of the wheel and its metallic center. Centrifugal action of the center on the elastic wire-mesh insert is said to provide constant contact between the wheel and the object being ground. When the abrasive part wears out, it is replaceable, it being possible to use the same metallic center and wire mesh insert over again. The center is made of aluminum with the wire mesh cast into the aluminum flanges and hub. Ever-Tru Abrasive Wheels, Inc., 145 Hudson St., New York.

Hygrometer

Wet and dry bulb instrument features accessibility for installation and servicing; by loosening two thumbscrews,

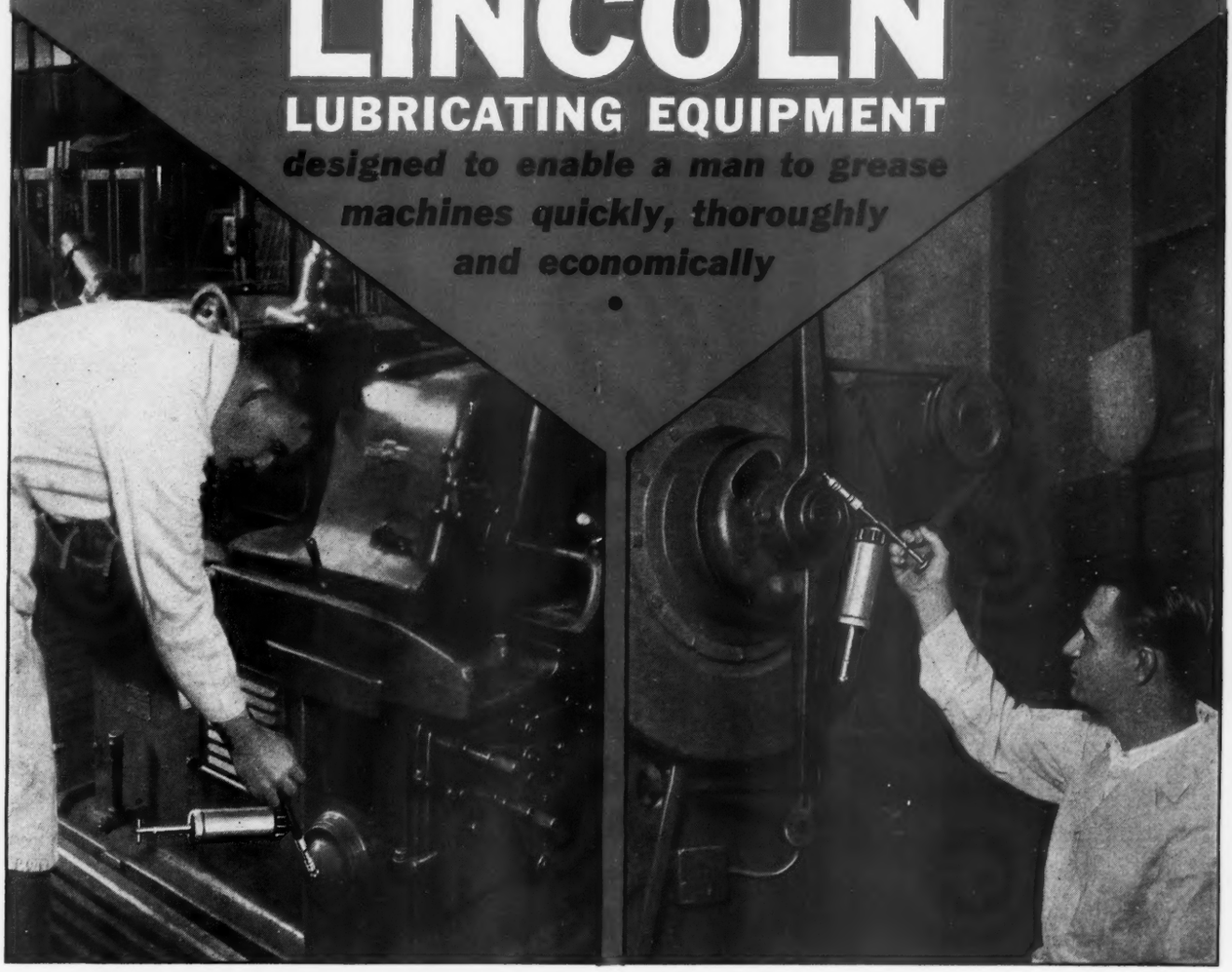


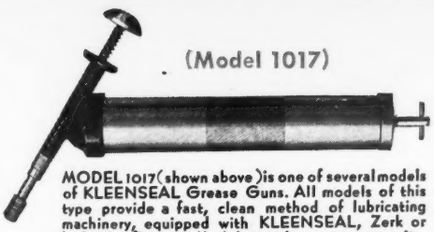
From any angle - - you can't beat

LINCOLN

LUBRICATING EQUIPMENT

designed to enable a man to grease machines quickly, thoroughly and economically





(Model 1017)

MODEL 1017 (shown above) is one of several models of KLEENSEAL Grease Guns. All models of this type provide a fast, clean method of lubricating machinery, equipped with KLEENSEAL, Zerk or hydraulic fittings. Model 1017 has 14-oz. capacity. Maximum pressure—5,000 lbs. . . . Models are also available in 3½...5¼...9 and 18-oz. capacities. Available also with coupler for button head fittings.

LEVER-TYPE GUNS are available in both high pressure and volume types, with attachments for push type, pin type and button head fittings. Model 1061 (illustrated below) handles all types of lubricants and develops pressures up to 10,000 lbs. . . . Capacity 18-oz.

(Model 1061)

You can eliminate many expensive bearing failures and save time and money by using Lincoln Lubricating Equipment for greasing the machines in your factory.

Lincoln makes a wide range of equipment for the most efficient application of grease lubricants. The line is complete. It includes small KLEENSEAL grease guns of the type illustrated. A man can hold and operate one of these guns with one hand—reaching fittings high on a machine or low, operate the gun from any angle—and do a thorough job of greasing . . . The Lincoln line also includes lever-type guns, larger hand operated units, and large power operated units, together with a complete range of full automatic and semi-automatic equipment. In addition to grease guns, Lincoln makes a complete line of KLEENSEAL and Button Head Fittings in all types and sizes to meet all replacement and modernization needs.

Obtain complete information through your nearest Lincoln distributor, or write us for Catalog No. 60.

By Invitation Member

Emblem of BUSINESS CHARACTER

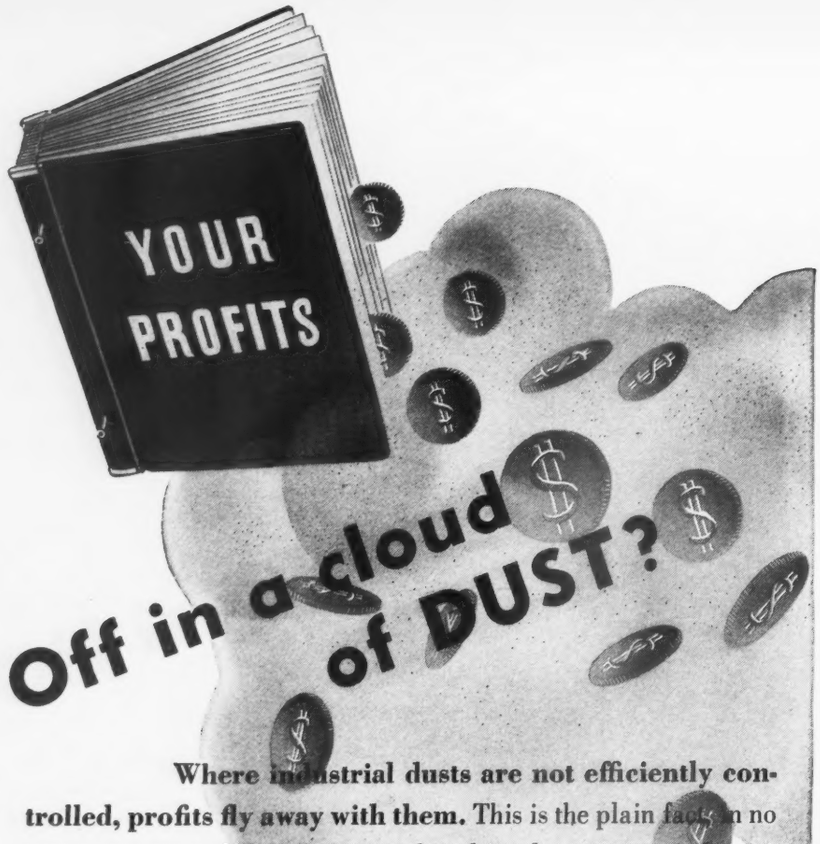
Rice Leaders of the World Association

Represents High Standing in NAME-PRODUCT-POLICY

LINCOLN ENGINEERING COMPANY

PIONEER BUILDERS OF LUBRICATING EQUIPMENT

GENERAL OFFICES: ST. LOUIS, MO. FACTORIES: ST. LOUIS, MO., DETROIT, MICH.



Off in a cloud of DUST?

Where industrial dusts are not efficiently controlled, profits fly away with them. This is the plain fact in no sense exaggerated. For dusts, produced in almost every industry, have a far wider influence upon costs than is commonly realized.

Many dusts are intrinsically valuable: to lose them is to lose a profitable source of income. Other dusts have an adverse effect upon production: they reduce the working efficiency of man and machine, increase the costs of maintenance and overhead.

Investigate! Find out *how,* and *how much,* you can save by scientific dust control. Take this first important step today: write for our *Bulletin D81*—free to any managing executive or operating engineer.

Buell Dust Collectors are engineered individually to meet the requirements of each specific job. They are the *only* collectors which bring you the combination of high extraction efficiency and low operating costs which the patented Van Tongeren design ensures. Maintenance costs are so slight as to be negligible. Operating costs are practically nil.

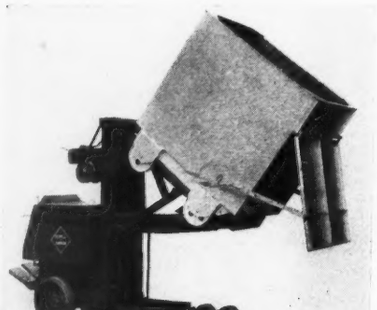
If you have a SMOKE problem you can readily solve it with Buell Fly Ash Collectors. All of the unique advantages of the Van Tongeren system are found in them—advantages convincingly demonstrated in hundreds of installations. Ask us to send you *Fly Ash Booklet A93.*

BUELL ENGINEERING
COMPANY INC
12 Cedar Street, New York

buell
DUST COLLECTORS

SALES OFFICES IN PRINCIPAL CITIES

the complete assembly swings out on a triple-hinged bracket. Skeleton guard around the bulbs prevents breakage but does not effect temperature or free circulation of air around the bulbs. The flat tube scales are mounted horizontally to make easier reading. Rubber grommets insulate the thermometer stems and bulbs from metal parts, eliminate bulb conduction error, and reduce chance of breakage from mechanical shock. Required opening in duct for installation is 8 x 2¾ in. Water is supplied the wick by filling the water bottle and inverting it in the bottle holder. Parts having contact with the water are treated for corrosion resistance. The thermometers are interchangeable, and replaceable. Taylor Instrument Cos., Rochester, N. Y.



Tilting Platform Truck

Rated capacity of this truck, Type ELN-10, is 10,000 lb. It is a 2-wheel drive, 6-wheel steer type. The compensating-rocker-type trail axle has steering levers above axle, and rods are constructed so as not to fall off ball end levers. It is equipped with a 500 per cent overload, high-torque motor that is direct-connected to free-coasting worm and wheel, and a controller that is electrically interlocked with a mill-type magnetic contactor. Angle body is locked on the platform. Its rocking motion is under control of operator. Dumping is possible at any height in range of platform. Has regenerative lowering feature and dynamic brake for speed control on ramps. The Elwell-Parker Electric Co., Cleveland.

Pressure-Reducing Valves

"Copes" valve W-DBI, a direct-operated, weight-loaded unit, is for controlled-pressure limits from a vacuum of 27 in. of mercury to a gage pressure of 10 lb. Regulation from fully closed to wide open is not more than 0.4 lb. Sizes ¾-10 in. are furnished in 125- to 300-lb. pressure standards. Type WS-1, a direct-operated, spring-loaded unit for controlled-pressure limits of 10-125 lb. Regulation from fully closed to wide open is not more than 6 lb. Sizes ¾-4 in. are available in 125- to 400-lb. pressure standards. Relay-operated, spring-loaded valves R-DBI and R-DSLH are for use with master controls in remote control of the pressure-reducing station. The controls cover a controlled-pressure limit of 2 to 600 lb. gage; regulation is not more than 5 per cent of controlled pressure, not less than 2.5 lb. Type R-DBI, used where the pressure drop across the reducing valve

PACKAGED PERFORMANCE + OPERATOR & MAINTENANCE SAFETY + NEAT APPEARANCE

Concentric Knockouts on top

Plenty of wiring space

Safety shield over line terminals

Approved Type A Safety Switch

High Interrupting Capacity
Quick make-and-break
Interlocked cover
Externally Operated

Fusible

Accessibility

Provision for locking

Pilot Circuit Transformer

Bulletin 7700 AC Contactor

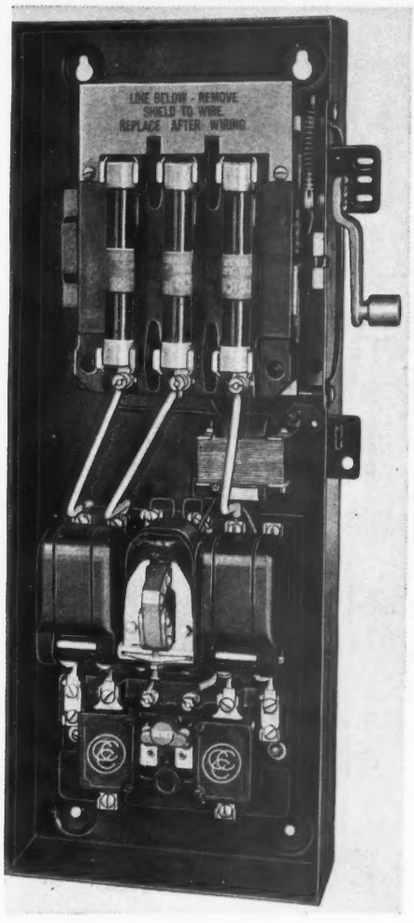
Heavy Duty Hammerhead AC Magnet Construction
Large Clearances
Equally satisfactory for applications requiring frequent or infrequent operation

Bulletin 7322 Thermal Overload Relay

Heaters designed to meet Underwriters Laboratory requirements
Enclosed thermal mechanism eliminates effect of stray air currents
Reliable control contacts on resilient mountings unaffected by vibration
Sufficient time delay on tripping to prevent unnecessary operation
Large electrical clearances
Easily accessible terminals

Plenty of wiring space

Concentric knockouts on bottom



OPEN VIEW
SPECIAL
BULLETIN 6018
TYPE TM A.C.
ACROSS-THE-LINE
STARTER.

THE "3C" Bulletin 6018 Type TM Combination Across-the-Line Starter for Squirrel Cage Motors, combines an externally operated Disconnect Switch with the Starter, plus a Pilot Transformer, all contained in one neat cabinet. This combination provides maximum safety for maintenance men, and utmost in safety to operators. Its appearance is greatly superior to that presented by separately mounted and conduit-connected Safety Switch and Starter. Pilot device maintenance is kept at a minimum, and there is marked economy in installation.

Starter features Dead Front construction. Starter cover can be opened *only* when the handle is in the "OFF" position. Switch cannot be thrown to the "ON" position until the cover is closed. Fuses are mounted directly above the blades in a position readily accessible for renewing. Fuses are dead when the Switch is in the "OFF" position. With the door open, the fuses are dead, and are located some distance from the live parts, thus permitting inspection, repairing, or replacement of fuses with maximum safety. When the cabinet door is open, every part is electrically "dead." The "hot" line leads are covered by an insulating shield at the top. When the cabinet is open, it is impossible to contact "hot" lines without removing this shield.

Placing the Safety Switch and Starter with interlocked cover in a single housing makes it impossible to work on a starter without opening the Safety Switch, because the door will not open unless the Safety Switch is in the "OFF" position.

This device provides a transformer in the cabinet to step 440 volt input for use on main currents, down to 110 volts for use on the Pilot Devices.

Generous wiring areas, neat appearance, simple installation, low maintenance, maximum safety, and exceptional service under heavy duty are outstanding advantages of these Starters.

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

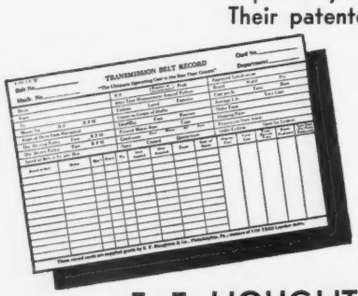
1146 EAST 152ND ST. CLEVELAND, OHIO

CERTIFIED

... to cost you less, per unit produced!

By the time you read this, the Certified VIM TRED Leather Belt pictured above on its way to a customer will have already produced many thousands of units . . . many more, we can safely predict, than any other belt under identical conditions. We are so sure of the superior performance of VIM TRED belts, that each one is *certified* "to cost *less* per unit produced." Their exclusive tannage gives them an exceptionally high coefficient of friction. Their patented tread means less slip, better grip . . . "geared" to the pulley. That's why these belts are proving this certification in plants the country over. They will do the same for you.

Write for a supply of the belt cost record cards shown below, with which to keep an accurate cost of every belt in your plant.



E. F. HOUGHTON & CO.
240 West Somerset St.
Chicago PHILADELPHIA Detroit

VIM TRED
LEATHER BELTING

will be moderate, is furnished in sizes 1-10 in., 125- to 900-lb. pressure standards. Type R-DSLH operates with pressure drops as high as 1,200 lb.; is furnished in 1- to 14-in. sizes in 125- to 1,500-lb. pressure standards. Northern Equipment Co., Erie, Pa.

Reflector

"Equalux" reflector concentrates the light from a "silver-bowl" incandescent lamp over a restricted area 54 in. in diameter, and provides uniform intensity over the lighted area. An enameled steel housing, the skirt of which shields against glare and softens the edge of the lighted area, protects the aluminum reflector. There is sufficient vertical illumination for servicing and repairing equipment over which the lighting unit is mounted. An average of 55 foot-candles is provided over the area, while intensities above 70 foot-candles are obtainable in the middle of the area with more than 40 foot-candles at the extreme outer edges. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Relays

"Midget" mechanical latch-in, electrical-reset relays are made in a.c., 110 and 220 volts, 6 and 3 amp. respectively; and in d.c., 115 volts, 1 amp. They are provided with two coils. The armature picks up and latches in the energized position when the lower coil is energized. Energizing the upper coil releases the latch, allowing the armature to drop out. No power is required in the coil circuit to hold the armature in either position. Coils provide for either momentary or continuous duty. The relays are for use with 3-wire thermostats, pushbuttons, and the like. Struthers Dunn, Inc., 139 North Juniper St., Philadelphia.

Hydraulic Lift Truck

Lift truck, hydraulic in lifting and lowering, automatically adjusts its lifting ratio to the load. One hundred pounds pressure on the handle elevates capacity loads. Furnished with safety valve to pre-

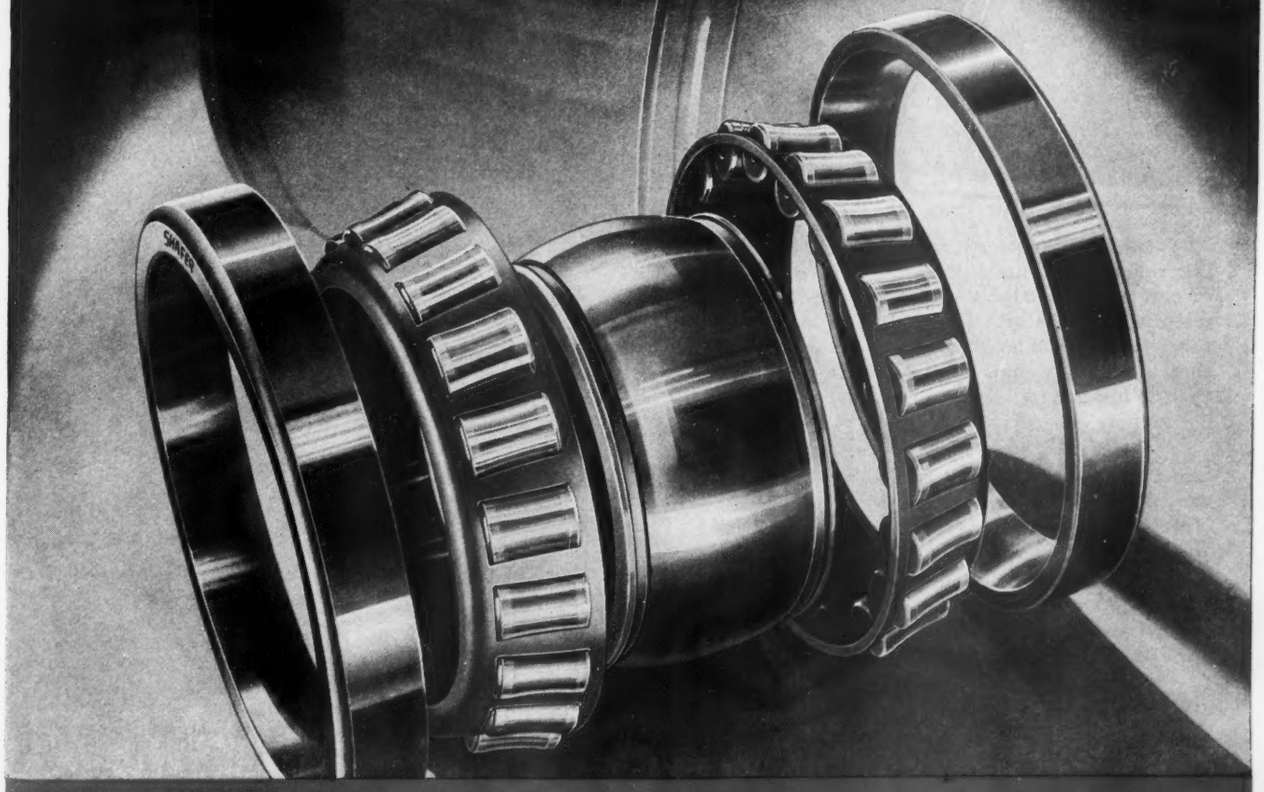
SHAFER

Machine builders using Shafer self-aligning Roller Bearings are including an extra margin of service and reliability for the users of their equipment. Integral self-alignment, capacity for radial and thrust loads, and simple adjustability, are features that assure bearing performance unchanged by severe operating conditions. Only the Shafer CONCAVE roller design combines all these features in one bearing.

Write for Catalog 14 with complete information

SHAFER BEARING CORPORATION
35 EAST WACKER DRIVE CHICAGO, ILL.

Available in a full range of sizes: Pillow Blocks • Welded Steel Pillow Blocks • Flange Units • Take-up Units • Cartridge Units • Hanger Boxes • Duplex Units • Flange-Cartridge Units • Conveyor Rolls • Radial-thrust Roller Bearings



SHAFER SELF-ALIGNING ROLLER BEARINGS

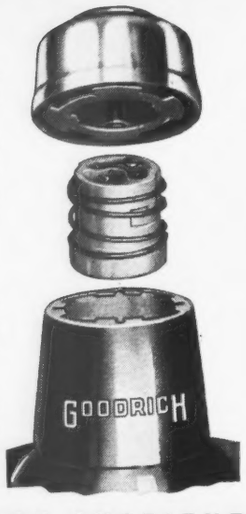
WHY IT'S WISE TO INSTALL
SEPRABLE REFLECTORS

All it takes is a quarter turn to release or attach this reflector . . . no screws, nothing to loosen or corrode. That's what makes it easier to service—and *much* simpler to install. You have only to wire the socket and attach to the hood. After that, you merely snap the reflector in place and the job is done.

"COME-APART" DESIGN

Since the resilient socket is also removable, it can, if damaged, be replaced for a few cents. This socket is spring-mounted to absorb vibration and lengthen lamp life.

Seprable Reflectors are finished in permanent porcelain enamel and offered in a variety of styles. See your electrical supplier or write us for literature.



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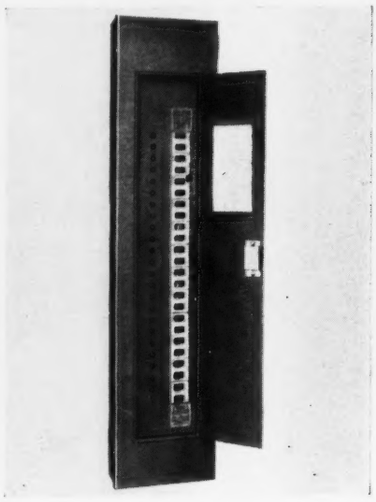
GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2904 N. OAKLEY AVENUE, CHICAGO, ILL.

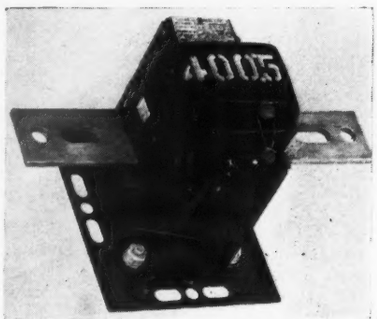
vent overloading. A variable lifting stroke allows loads to be "inched" up with short strokes, or boosted quickly with long ones. The handle does not kick back; handle grip is non-blistering, turning with the hands. The truck operates from any spot within a horizontal arc of 180 deg. Capacities available: 2,500, 3,500, 5,000 and 6,000 lb. Custom-built for any capacity to 10,000 lb. The Service Caster & Truck Co., 434 Somerville Ave., Somerville, Mass.

Circuit Breaker

Type LX "Multi-breakeR," built to fit into H-beams, is an adaptation of the Type M "Multi-breakeR" and can be furnished in single- and double-pole branches up to 50-amp. capacity. These panels are available for 8- and 10-in.

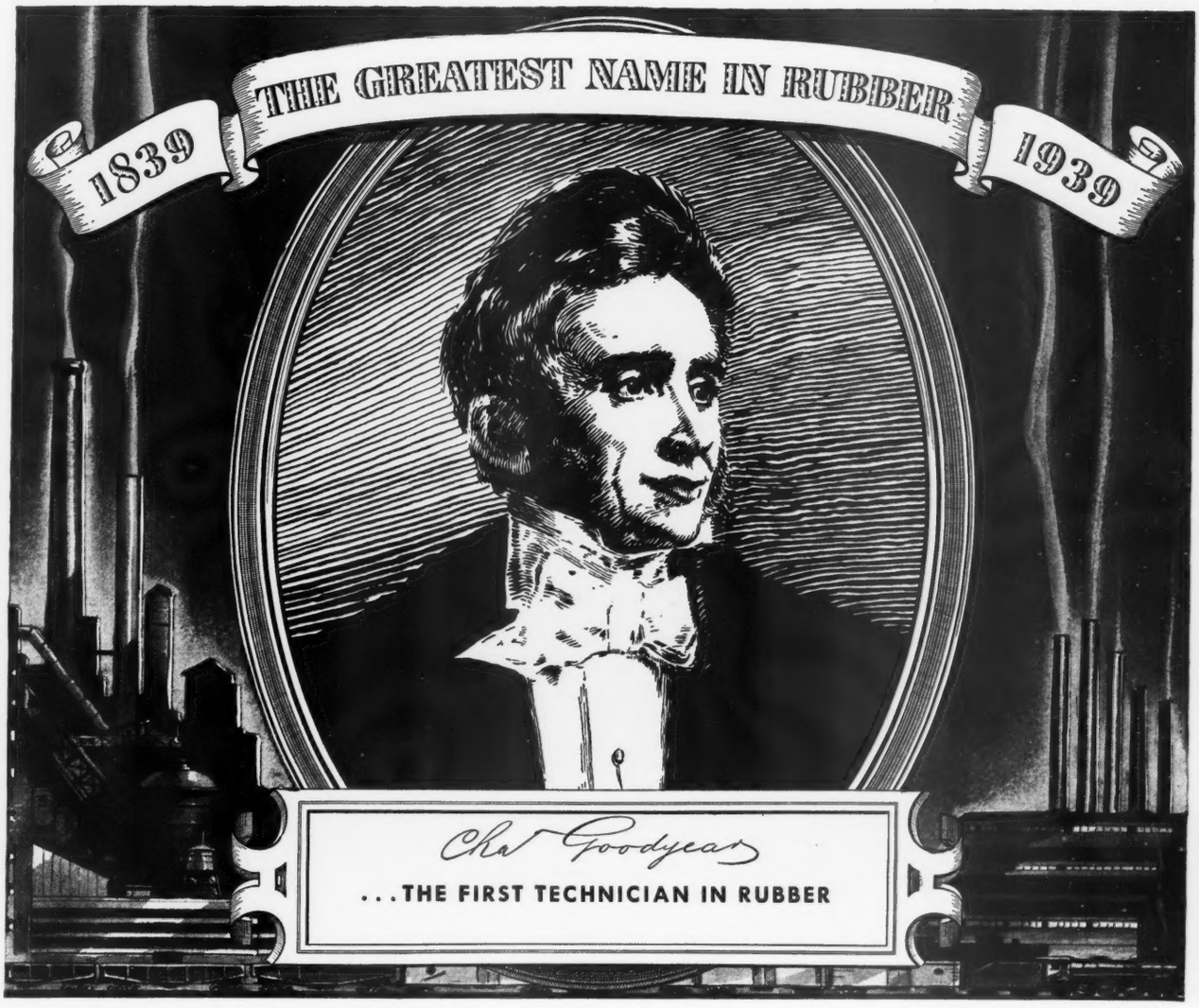


beams, 3- or 4-wire a.c. The trim is hinged to the box and held closed with screws; the door is provided with a lock and hinged to the trim. Square D Co., Detroit.



Current Transformer

Type JL-1 indoor current transformer, rated at 600 volts, is designed to combine advantages of small size with accuracy for metering on low-voltage circuits. The primary windings are capable of continuous operation at 150 per cent of rated primary current. Primary terminal surfaces are silver-plated. The secondary terminals are of the solderless type and can be operated with a screw driver. A removable mounting plate permits mounting the transformer on pipe. Available current ratings: 200/5, 400/5, 600/5 amp. General Electric Co., Schenectady, N. Y.



"*Notwithstanding all the difficulties he encountered, he went on. If there was reproach, he bore it. If poverty, he suffered under it. But he went on, and people then saw, when his invention was completed, that what they had been treating with ridicule, was sublime; that what they had made the subject of reproach, was the exercise of great inventive genius; that what they had laughed at, the perseverance of a man of talent with great perceptive faculties, with indomitable perseverance and intellect, had brought out as much to their astonishment, as if another sun had risen in the hemisphere above...*

"I believe that the man who sits at this table, Charles Goodyear, is to go down to posterity in the history of the arts in this country, in that great class of inventors, at the head of which stands Robert Fulton... in which class stand the names of Whitney, and of Morris, and in which class will stand 'non post longo intervallo' the humble name of Charles Goodyear."

From the address of DANIEL WEBSTER *before the U. S. Circuit Court, District of New Jersey, in 1852.*

HE DISCOVERED *the process of vulcanization that gave us rubber as we know it today.*

He was first to conceive rubber's wide application in meeting industry's many problems.

He built the first practical rubber belting and demonstrated its efficiency over other kinds.

He fashioned from rubber the first successful hose for handling air, steam, oil, acids and other solvents.

He shaped the first enduring rubber molded goods; contrived from rubber the first dependable packing for steam engines.

In all he either manufactured, patented or envisioned more than one thousand different applications of rubber before his death 79 years ago.

His name was Charles Goodyear. He was the first technician in rubber.

◆ ◆ ◆

● This year marks the One Hundredth Anniversary of Charles Goodyear's discovery of vulcanization. In recognition not alone of his great contribution to the world but also of the self-sacrifice, the faith and courage of the man, this tribute is published by an enterprise founded long after his death — a business that, inspired by his example, seeks by serviceability to deserve his name. Dedicated to that service today is the G.T.M.—Goodyear Technical Man—who in countless new industries of which Charles Goodyear never dreamed carries on his work of multiplying rubber's usefulness through specialized application to industrial needs.

THE GOODYEAR TIRE & RUBBER COMPANY
AKRON, OHIO

PAGE FENCE

HOW HIGH IS AN 8-FOOT FENCE?

Of course an 8-foot fence is 8 feet high, but the point is that PAGE service will help you select the proper fence whether it be 4 or 14 feet high. PAGE—America's first wire fence since 1883—alone offers you a choice of five quality fence metals to fit all atmospheric conditions and an exclusive wing-channel post designed for greater utility. One of our 92 Association Members is nearby to render skilled, courteous service. Secure his name and free literature—write PAGE FENCE ASSOCIATION, Bridgeport, Conn.

American "DUSTUBE" DUST COLLECTOR

LEADING INDUSTRIAL PLANTS CHOOSE "DUSTUBES" BECAUSE OF PROVED PERFORMANCE AND OPERATING ECONOMY

AN AMERICAN "DUSTUBE" Dust Collector installed at the Walworth Co., Greensburg, Pa.

Complete Dust Control need not be a costly evil. Especially when you can be sure of a low cost solution with "Dustubes". Let an experienced American engineer show you how. There is no obligation of course. Write for Dust Control Book No. 22.

You can depend upon "Dustubes" to give you *complete* dust control at lowest cost because they are used in hundreds of plants like these:

Timken Roller Bearing Co.
Bethlehem Steel Co.
The Walworth Co.
Magnus Metal Co.
(Div. of Nat'l. Lead Co.)
Fafnir Bearing Co.
Ford Motor Co.
Allis-Chalmers Mfg. Co.
American Steel Foundries
Chrysler Corp.
Oliver Farm Equipment Co.
General Electric Co.
Monsanto Chemical Co.
The Glidden Co.
Western Electric Co.
Nash-Kelvinator Corp.

THE American FOUNDRY EQUIPMENT CO. 374 S. BYRKIT ST. MISHAWAKA, IND.

Hobby Show

(Continued from page 55)

show eliminated any trouble with these factors.

By midnight the day before the show everything was ready for the opening. By midnight the following night practically everything was out of the plant. The show was held on a Saturday, so that there was little interruption in assembly-line operations, even though the show was built directly on the assembly floor.

Took Out Insurance

All the exhibits were insured by a blanket policy. However, no loss or damage was reported. One of the reasons for this was undoubtedly the fact that 12 men were on guard duty at all times during the show. They kept their eyes especially on the children, who, in many cases, wanted to handle the exhibits. They also helped to control the size of the crowd around each exhibit and the traffic into the show. This, we found, was important. You must have some way of shutting off the crowds from the show after people are standing three deep around all the exhibits.

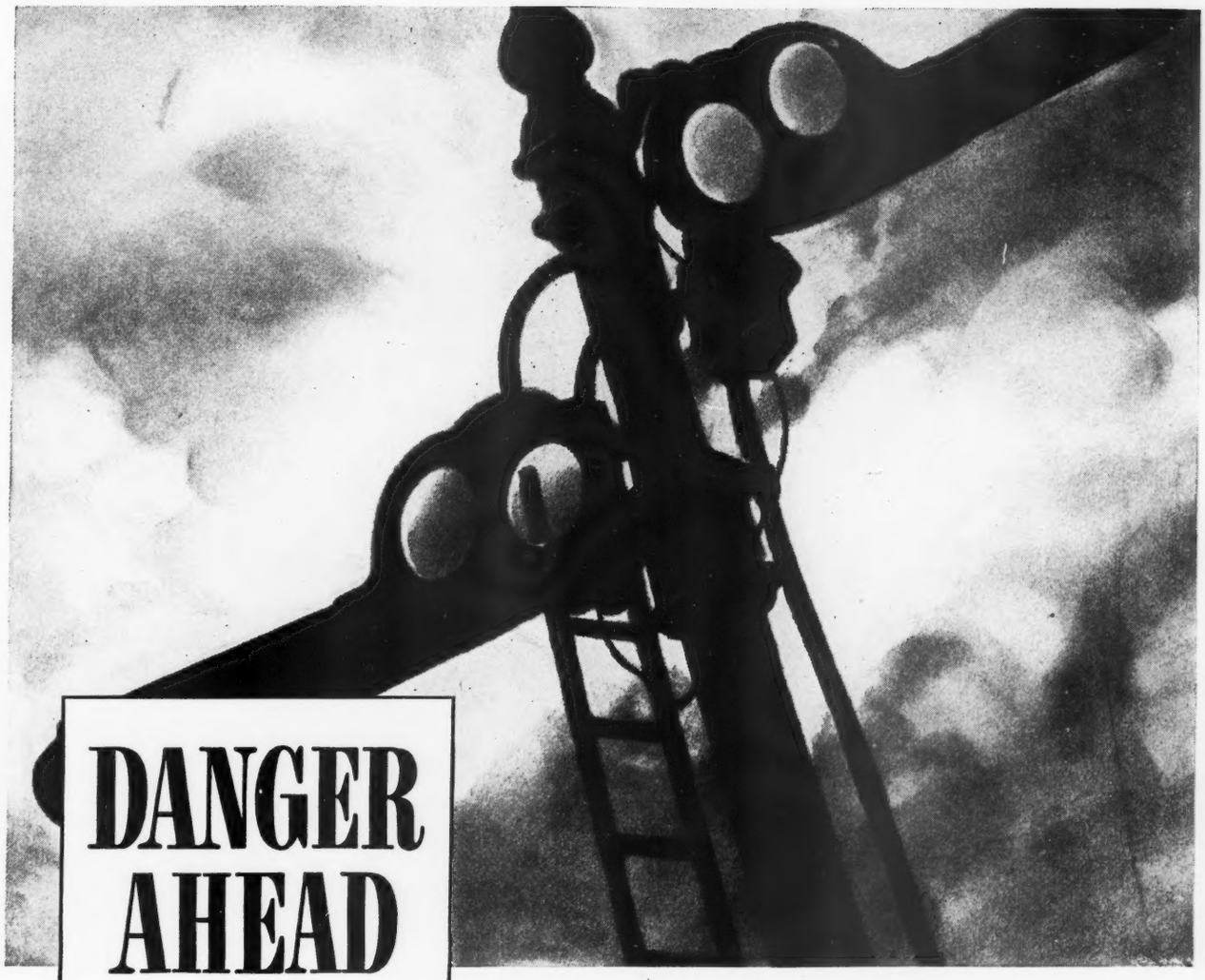
No Speeches Allowed

In this connection we found that exhibitors have to be emphatically warned against speech making. When a hobbyist, who has spent years in the quiet of his home making or collecting doodads, gets a chance to show his stuff to hundreds of curious question-askers, you can't blame him for getting expansive. Yet if there is to be any control over a hobby show, we found you must limit the hobbyist to a brief answering of questions.

The matter of awarding prizes to exhibitors is one that is certain to plague a hobby-show committee. Prizes add incentive, yet they may change the complexion of the show from that of exhibition to competition. And then how are you going to compare water color painting with knotted belts?

One thing we *did* find out. It's not so good to award prizes by popular vote. The best bet is probably to let some outside committee make the awards, based on such things as originality, craftsmanship, ingenuity of presentation.

Another problem—many employees spend leisure time with hobbies that are not strictly their own. An entire family, for instance, may be collecting



DANGER AHEAD

... for Plants and Factories With Inadequate Water Cooling Systems!

Guard employee health and safety ... build good-will ... increase efficiency by installing a modern Frigidaire Water Cooling System

● An inadequate or old-style water cooling system is a constant threat to employee safety and health ... breeds accidents, inefficiency, disgruntled employees. Moreover, such systems are usually costly to operate—and require frequent servicing.

That's why America's leading industrial plant and factory managers are finding it a wise business investment to replace old-style methods with modern Frigidaire Water Cooling equipment. Frigidaire equipment not only does a better cooling job—thereby increasing employee comfort and contentment—but actually does it for *less money!* In most all instances, in fact, replacement will mean savings great enough to pay installation costs in a short period of time.

Act now to modernize your plant—help avert accidents—increase efficiency—build employee good will—with a new Frigidaire Water Cooling System. For full information about the complete line of Frigidaire industrial and office water coolers, see "Water Coolers" section of your Classified Telephone Directory for location of your nearest Frigidaire Dealer.

Or write: Frigidaire Commercial Division, General Motors Sales Corporation, Dayton, Ohio.

Frigidaire Industrial Water Cooler Model MI-25, especially designed for steel mills, foundries, etc., where unusual usage and demands are experienced.

FRIGIDAIRE WATER COOLERS

Made Only By General Motors

GET CEMENT FLOORS CLEAN!

Dirty, grease or oil-spotted cement floors in your plant are accident hazards. They are unsanitary, unsightly and unnecessary. You can not only clean them quickly and inexpensively, but can also HARDEN, WHITEN and dust-proof them with

MAGNUS CEMENT CLEANER

This unique cleaner renews your floors without rebuilding. It easily removes all grease, oil and other dirt from cement floors, leaving them in better condition than before. You can keep your floors constantly clean and add much to their service life with MAGNUS CEMENT CLEANER.

Other kinds of floors? Yes—there's a Magnus Cleaner for every type of flooring. Ask for details.

WRITE FOR DETAILS ON FREE TRIAL OFFER

You simply mix with water and try it out on your dirtiest floor. You'll never be convinced faster or more thoroughly.

MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants

220 South Avenue **Garwood, N. J.**

Magnus CLEANERS

How to Check IDLE TIME of Machinery

Do You Know Exactly How Long Each Machine Stood Idle?

The *Servis Recorder* tells you. See how "time down" stands out on the chart below. You can't miss it. You can't help but reduce it! Suppose you could reduce idle time on all your factory machinery merely 10 minutes a day! What would it amount to in a year—or even a month! More than you'll ever save by "little economies."

The *Servis Recorder* bolts or clamps right on the machine itself—no ink, no pencils, no electric wires. Send for folder. *The Service Recorder Co. 1422 Euclid Avenue, Cleveland, Ohio.*

Stop of 40 minutes waiting for material
Late start after lunch period
Three 10-minute stops—machine jammed by poor material
Didn't get started until about 9 a.m.
Machine idle for half an hour... why?
Machine stops half an hour before quitting time
The SERVIS RECORDER

small elephants. Or an employee may be working with his father and brother, employed elsewhere, making tricky garden ornaments.

For that reason we shall possibly expand our show in future years to include family exhibits, limiting entries, of course, to one exhibit from each family. This will allow a wife, for instance, if the employee has no hobby, to bring in her needlework, or a son to bring in his model airplanes. Expanding the show to include one exhibit from each family should add greatly to the general interest in open house, and also help to bring employees' families closer together. After all, that is the philosophy of an open house.

Some Recommendations

We shall probably repeat the hobby show next year although plans for next year's open house are as yet indefinite. In the meantime the committee has made the following recommendations:

1. Post a notice of the show nine months and then again six months in advance.

2. Expand the show to include one exhibit from each family.

3. Allow plenty of aisle space in front of the exhibits.

4. Let an outside committee select the prize-winners.

The Labor Audit—A Check-Up on Policies

(Continued from page 57)

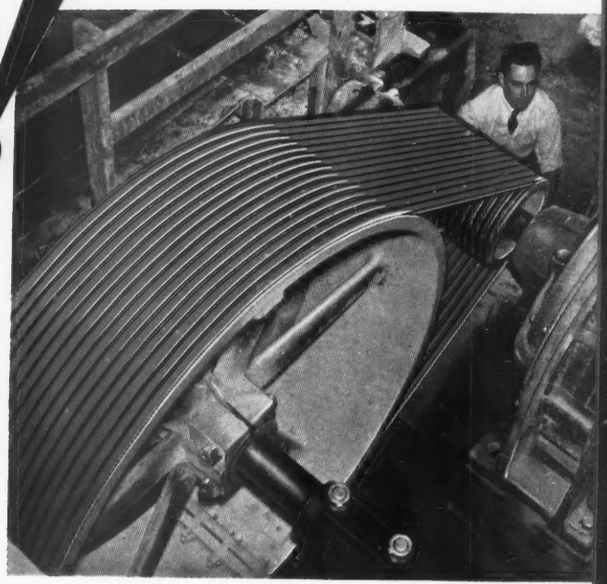
standardized? Have you written descriptions or charts of your production organization? What control over work in process? To what extent is output standardized, and how? Do workers understand that inefficiency in production may depress wages? Do workers understand that inefficiency in selling may affect wages and regularity of employment? What effort is made by the sales organization to steady work? Detail methods.

It will be seen, then, that one purpose of the labor audit is to ferret out all the pertinent facts and figures affecting employer-employee relations, and to set them forth in a comprehensive way and in their proper perspective. But the process of making a labor audit is not merely the formal procedure of studying a body of relevant material. A genuine audit is a process of continued education. It is a

(Continued on page 118)

SAVES $1,656 per drive!

Read How a Large Pulverizing Company Saves $1,656 Per Year PER DRIVE by Changing to Allis-Chalmers Texrope Drive! Learn How You Can Make Similar Savings in Your Plant . . . With the Equipment That Pays For Itself!



When you run your drives 24 hours a day, 300 days a year, you've got to have drives that give you the best service . . . at the lowest possible cost! And when you install a drive that saves you 23¢ an hour . . . $1,656 per year PER DRIVE . . . that's the kind of savings you want in your plant!

That was the experience at the National Pulverizing Company plant in Millville, N. J. after installing a 150-hp Texrope Drive! They found that the Texrope Drive required 32 amperes at 440 volts less than the type of drive formerly used . . . a point verified by the utility company . . . an actual power saving of 23¢ an hour! Nor was this all—

For they found that the Texrope Drive gave them a new improved dependability of performance so necessary when running 24 hours a day . . . a lower maintenance with drive and machinery . . . a longer life to transmission units! All these are *Extra-Value* features that you get by using Texrope Drives . . . features that cut your operating costs . . . improve your plant efficiencies . . . increase your year's profits!

Texrope Drives Pay for Themselves!

Whatever your drive problems, Texrope may be the answer—with better power transmission . . . at lower cost! Texrope Drives cover the entire range from 1/4 hp to 2,000 hp, and include sheaves and belts for practically every industrial power transmission job.

TEXROPE DRIVES are 98.9% efficient . . . an important factor in the amazing savings made by this 150 hp Texrope Drive at the National Pulverizing Co., Millville, N. J. A second similar drive was recently installed.

Let the facts on Texrope performance show you why you should use Texrope Drives! Call the Allis-Chalmers district office near you. There's a Texrope trained engineer whose job it is to help you solve your transmission problems. Or write direct to Allis-Chalmers for information on Texrope Drives . . . the Equipment that Pays for Itself!

Vari-Pitch Speed Changers • Texrope V-Belts • Duro-Brace Texsteel Sheaves • Vari-Pitch Sheaves • Standard Cast Iron Sheaves • Adjustable Pitch Diameter Texsteel Sheaves • 2-3-4 Combination Sheaves • Straitline Automatic Motor Bases • Oil Field Drilling Rigs

1013

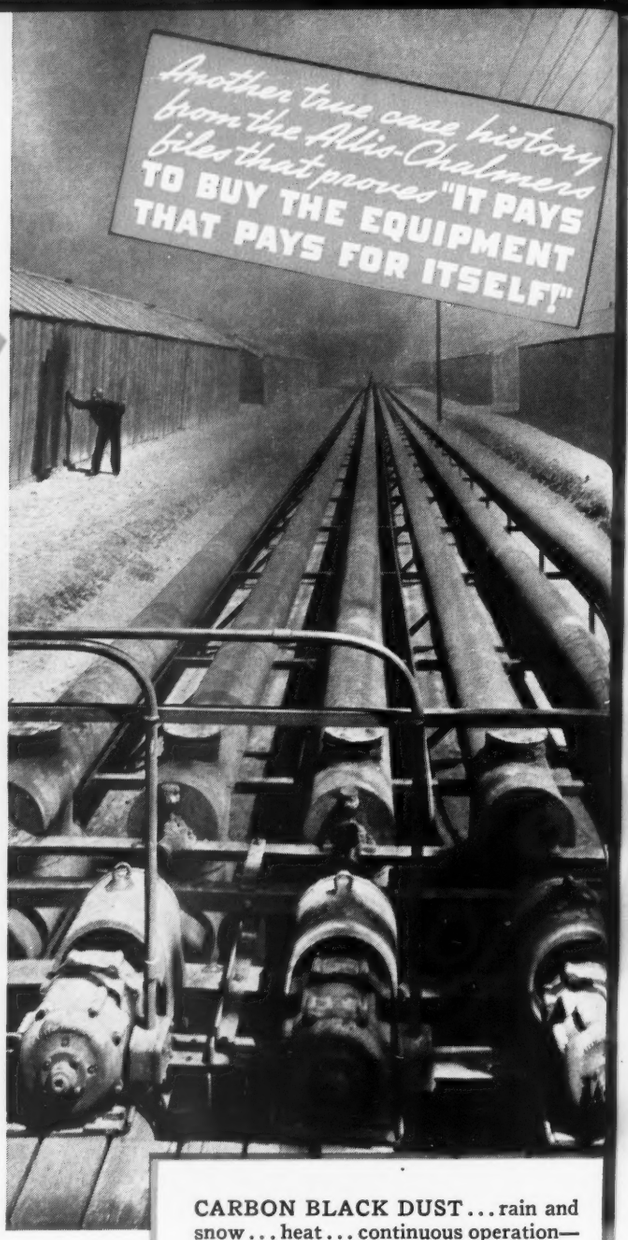
Belts by Goodrich

TEXROPE DIVISION

ALLIS-CHALMERS

MILWAUKEE-WISCONSIN

"ALLEYS OF BLACK HELL" WHERE ONLY THE FITTEST SURVIVE!



Allis-Chalmers Lo-Maintenance Motors Win Place as Standard Motor Equipment in the "Alleys of Black Hell" of Carbon Black Industry! Learn How Lo-Maintenance Motors Can Serve You . . . In Your Industry . . . Under the Toughest Conditions!

"Alleyways" they call them in the carbon black industry—outdoor passage-ways where carbon black is pulverized and handled under the worst possible motor conditions!

Picture it—the air thick with carbon black dust, so fine it passes through a 300-mesh screen . . . snow and rain beating down in the winter . . . great southwest dust storms bringing suffocating dust in the spring and summer . . . and the air temperature in the alleys often soaring to as high as 180° F.!

Add to this—operation that requires 24-hour-a-day motor service . . . 7 days a week . . . with the motor running one way for 8 to 10 minutes, then instantly reversing itself!

Industry Switching to Allis-Chalmers!

Truly "Alleys of Black Hell" . . . with motor conditions so tough that the whole industry is switching to the motor that has proved it can stand up under this punishment! And that motor is the Allis-Chalmers totally-enclosed Lo-Maintenance Motor!

Why is the carbon black industry switching to Allis-Chalmers Motors? Why are hundreds of other industries coming to Allis-Chalmers for the answer to their toughest motor problems?

Get Lo-Maintenance Facts!

It's because of the Full Measure construction that's a part of every Allis-Chalmers motor . . . the extra margin of protection and performance that gives you more than just a rated horsepower! For when you buy a Lo-Maintenance Motor, you get a motor that has built into it the results of Allis-Chalmers 90 years of progressing with industry . . . of engineering motors to drive their own line of heavy duty industrial equipment!

And combined with that are extra-value features of construction—high carbon steel frame . . . indestructible rotor and distortionless stator . . . no skimping on materials! All these work for you—help beat time-wasting shutdowns . . . reduce maintenance costs . . . give you years of continuous, trouble-free motor service!

CARBON BLACK DUST . . . rain and snow . . . heat . . . continuous operation—all unite to make conditions tough for motors in the "alleys of black hell" of the carbon black industry! That's why carbon black manufacturers today use more than 2,000 Allis-Chalmers totally-enclosed Lo-Maintenance Motors!

Learn how Lo-Maintenance Motors can save you money . . . give you better performance! Call the district office near you. Or write to Allis-Chalmers direct. A trained motor engineer will be glad to go over your motor problems with you.

MOTORS FOR ALL APPLICATIONS FROM ½ HORSEPOWER AND UP

ELECTRICAL DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

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(*Advertisement*)

"Where Are My Wandering Tools Tonight?"

If they are under Jim's bench, in Tom's locker, haphazardly or improperly stored, better start looking for that time and money wasting Ethiopian in your toolroom.

By H. B. SPACKMAN
V. P. in Charge of Sales, Lyon Metal Products, Incorporated

RECENTLY a large railroad system, that had long taken the efficiency of its numerous toolrooms more or less for granted, had occasion to make a complete inventory of its toolroom stocks.

The facts unearthed was decidedly disturbing. For example, a tremendous number of tools that were requisitioned for relatively short and simple jobs never got back to the toolroom. And because inadequate, unhandy storage facilities made close and frequent check-ups of stocks difficult, subsequent requisitions from the shop for tools of the same type quickly resulted in unnecessary orders for new tools.

Further search disclosed the fact that most of the missing tools had always been available . . . but were "frozen" under the benches and in the personal lockers of mechanics and machine operators. These men were not dishonest. But they had found it so difficult and time-consuming to get small tool requisitions filled that, as a protective measure, they avoided returning anything to toolroom stock unless the stockkeeper demanded it.

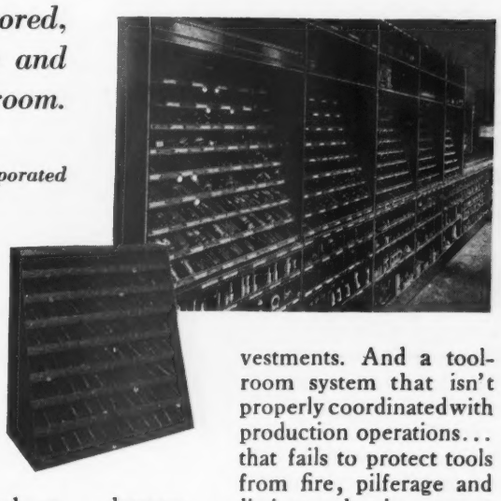
Of course, no two toolrooms are exactly alike. In some cases, the storage system is efficient, but the equipment so constructed or arranged that tools are improperly protected against damage while in storage or while being withdrawn for use. In other cases, where dies, tools and fixtures are changed frequently, the storage equipment is so inflexible that it cannot be economically adapted to new requirements.

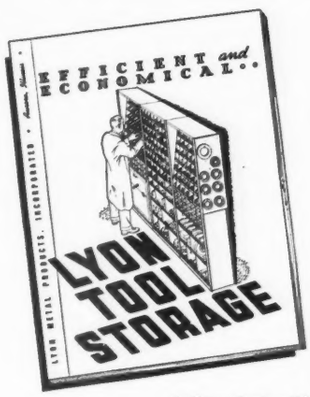
For example, an Eastern steel mill found that, while its system kept a near perfect check upon tools in use and in storage, the physical characteristics of its toolroom storage equipment was the cause of heavy breakage and damage losses.

Eleven-foot shelves had been installed with the idea of conserving floor area. In removing and replacing many items it was necessary for the stockkeepers to use ladders, and the dropping of tools was a common occurance.

By adopting a suitable type of compact steel shelving, bin heights were limited to 7 feet without increasing the floor area of the toolroom . . . and losses from damaged tools took an abrupt drop.

Such case studies suggest that if tool storage systems were always planned with one eye on a tool inventory and the other on a record of tool handling costs, the average toolroom would be modeled after Uncle Sam's gold depository at Fort Knox. For tools usually represent one of the largest plant investments. And a toolroom system that isn't properly coordinated with production operations . . . that fails to protect tools from fire, pilferage and damage . . . dissipates that investment at an appalling rate.





HERE'S YOUR KEY To New Tool Storage Efficiency

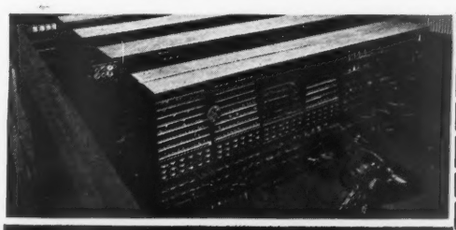
. . . Shows the most complete line of Toolroom Equipment ever built.

● No matter how complex or unusual your tool storage problem, it can be satisfactorily solved with some economical combination of the Lyon adjustable steel equipment shown in this new, complete catalog.

Built to last a lifetime, Lyon Steel Tool Storage Equipment prevents misplacing and damaging tools through improper storage . . . protects against fire and pilferage . . . saves labor and floor space. Shelves and dividers are completely flexible . . . can be taken down quickly and rearranged to meet new tool storage needs and space requirements.

This new book merits your immediate attention . . . may help you effect major toolroom savings. Ask for FREE copy today on coupon below, or your business letterhead.

LYON METAL PRODUCTS, INCORPORATED, AURORA, ILL.



LYON STORAGE EQUIPMENT Service
LYON METAL PRODUCTS, INCORPORATED, Aurora, Illinois

Lyon Metal Products, Incorporated
1203 River St., Aurora, Ill.

Please send FREE copy of new, complete catalog showing Lyon Steel Tool Storage Equipment for every toolroom need.

Name and Title_____

Firm Name_____

Address_____

City_____ State_____

-And the Equipment was Furnished by CLARAGE

M. Fruchtbaum, Philadelphia
Architect and Engineer

BUYING DECISION BASED ON 7 YEARS' EXPERIENCE WITH CLARAGE UNITS IN ANOTHER ECKRICH PLANT

Last year when Peter Eckrich & Sons, Inc., built their new $250,000 factory and office building in Kalamazoo, there wasn't much question as to *whose* equipment should be installed for air conditioning, product cooling, heating and ventilating.

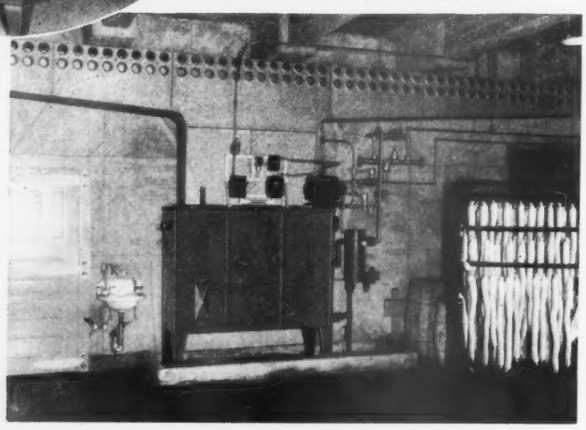
Here's What Mr. Clement Eckrich, President, says:

"We need the best in air conditioning and product cooling, in order to maintain our high quality sausage standards, and naturally we like to save money as well. So when it came to selecting this equipment for our new establishment in Kalamazoo, we gave *first consideration* to Clarage, since Clarage units had given us such excellent results for more than 7 years in our Fort Wayne, Ind., plant."

Clarage Multitherm Conditioning Unit servicing the Eckrich offices. Multitherms are COMPLETE AIR-CONDITIONING PLANTS IN ONE ASSEMBLY. Easily installed without costly building changes.

DO YOU WANT the same kind of results and economies from your air-handling or air-conditioning installation? Certainly you do! **THEN CONSULT WITH CLARAGE FIRST—THAT'S A SURE WAY.** For Clarage Fan is one of the few large manufacturers **SPECIALIZING EXCLUSIVELY IN THIS SPECIALIZED FIELD—capable of meeting every requirement—MORE THAN 25 YEARS' EXPERIENCE.**

In all industrial centers we have branch offices. Use your local telephone, or write us.



One of the sausage storage rooms equipped with a Clarage Unit Cooler. Clarage Coolers cost less to install; less to operate than any old-fashioned system of wall coil refrigeration. In this new Eckrich plant there are seven other units of this type.

COMPLETE
AIR CONDITIONING
•
VENTILATION
•
HEATING
•
COOLING
•
MECHANICAL DRAFT
•
FANS & BLOWERS FOR INDUSTRIAL NEEDS

CLARAGE FAN COMPANY • Kalamazoo, Mich.
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

(Continued from page 114)

human, personal-contact procedure, based upon conference, discussion, back-and-forth questions and answers. To ignore the educational value of the audit is to miss its main purpose and the opportunity it offers of improving the quality of the personnel.

The labor audit not only reveals and interprets the facts of a given situation as revealed by the statistical records, but it attempts likewise to bring to management the psychological subtleties and complexities of the causes basic in labor disputes. Wisely used, it is valuable as a method of checking up all relevant items, even though some of them may not be operative at the time of making the audit. Personal prejudice, favoritism, bias, figure too frequently in employer-employee relations. The audit will furnish evidence beyond dispute, and the more factual the evidence can be made, the more convincing will be the recommendations that it will be possible to deduce from it.

Many responsible corporation executives rarely contact their employees as human beings. They need an impartial picture of the personnel facts as set forth in the records. In a disturbed labor situation they need to know what those affected really think. It is significant that, as a result of the pressure of unions from the bottom up, more employers than ever before are striving to see their labor problem in its entirety. The problem of obtaining the necessary personnel facts in large corporations, with many widely scattered plants, is a serious one. The value of the labor audit technique and standard procedure is especially valuable in such large corporations. It can aid materially in obtaining, comparing, and evaluating vital information.

It should be made clear that the answers to the check-list questions do *not* constitute the labor audit. They are merely some of the facts upon which the more complete analysis and recommendations must be based. Detailed study of these facts will be made around the conference table, where top executives, supervisors, and the rank and file will sit down, combine their thinking, and work out labor policies. All those to be affected by labor policies should participate in building them.

In companies where no organic personnel policy exists, the audit, with its accompanying recommendations, becomes a convincing brief for the adoption of such a policy. It may reveal the means of developing a sound policy, or it may convince management that changes in existing policies are needed.

4 Reasons Why

YOUR PLANT MANAGER SHOULD LOOK INTO . . .

FELTERS CERTIFIED UNISORB*

1 VIBRATION transmission causes plant maintenance costs to skyrocket unless controlled.

2 FELTERS Certified Unisorb has proven to be an effective vibration aid.

3 FELTERS Certified Unisorb is inexpensive—it is not affected by oils and greases—it has a long life.

4 FELTERS Certified Unisorb is installed easily—no ripped-up floors—no bolting down—no long delays.

• *Send for our free illustrated book on Vibration. It tells of some of the many installations made by Felters engineers. Write for your copy today!*

THE FELTERS COMPANY, INCORPORATED

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OFFICES AT NEW YORK, CHICAGO, PHILADELPHIA, DETROIT, ST. LOUIS, DALLAS, SAN FRANCISCO

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* Reg. U. S. Pat. Off.

HOW INDUSTRY SAVES BY USING LIGHT POWER TOOLS

Low first cost, economical operation and low maintenance cost are some of the reasons for the rapid adoption of light power tools by industry.

Delta tools, for instance, are produced under modern production conditions like the modern automobiles. This means they cost less for the same production value than heavier tools that are made up either in small lots or on special order.

While no claim is made that light tools can or will replace heavier machines on many classes of work, there are many operations on which the lighter tools will not only perform as well as heavier, more expensive machinery, but will actually out-perform and outwear the heavier machines, due to more modern design, the use of selfsealed ball bearings, etc.

Delta low-cost drill presses require less power to operate. Replacement parts cost less. Their upkeep cost is remarkably low. They are flexible, and can be used in special set ups and in numerous combinations. They are portable and can be used for auxiliary operations. They occupy less space. Above all, they have proven all these advantages to thousands of this country's leading manufacturers.

Find out how you can cut your cost with Delta tools. Send coupon below for latest 1939 Delta Catalog, and name of nearest Delta dealer.

DELTA MFG. CO.
656 E. VIENNA AVE. MILWAUKEE, WIS.

DELTA MFG. CO.
656 E. Vienna Ave.,
Milwaukee, Wis.

Gentlemen: Please send me new 1939 Delta Catalog.

Name .....

Firm .....

Address .....

City ..... *State* .....

Daily Schedules Bar Idle Maintenance Time

(Continued from page 19)

floor, repairing a window or a conveyor, or any other work of a general character.

Unpredictable work of this sort cannot be assigned ahead of time on the Master Load Sheet, of course. To record the total of this, it is posted from the individual load sheets to a work sheet serving merely to accumulate the total of it.

To this same account also is charged all labor done regularly, such as that done by sweepers, elevator operators, and power house employees.

Material costs are taken from purchase orders issued for the job, or from Hollerith requisition cards if the material is carried in stock.

Organizing the work in the manner described permits a daily survey of all work ahead of the department and offers an opportunity to advance or retard a job as conditions warrant. Furthermore, the work of each man is assigned ahead of time so that no waiting is involved. The maintenance foreman compares the time taken on each repair requisition with the estimated time, to check performance. If the former is abnormal as compared with the latter, the reason is noted on the repair requisition so that the works engineer may know why additional time was required. The records are changed accordingly.

Employers Organize for Bargaining

(Continued from page 58)

has long been in the thick of San Francisco's toughest labor disputes, the waterfront strikes, as president of the Waterfront Employers' Association and of the Pacific American Shipowners' Association. Also like Lapham, he has the confidence of Coast labor leaders. There are the six main objectives of the Council as set forth in the incorporation papers:

1. To secure collective action by employers to the end that stable, peaceful, and harmonious relations between employers and employees will be established, and that wages and working conditions fair and just to both be maintained, and honest and faithful observance of all agreements by all parties concerned be procured, always recognizing the public interest as paramount.

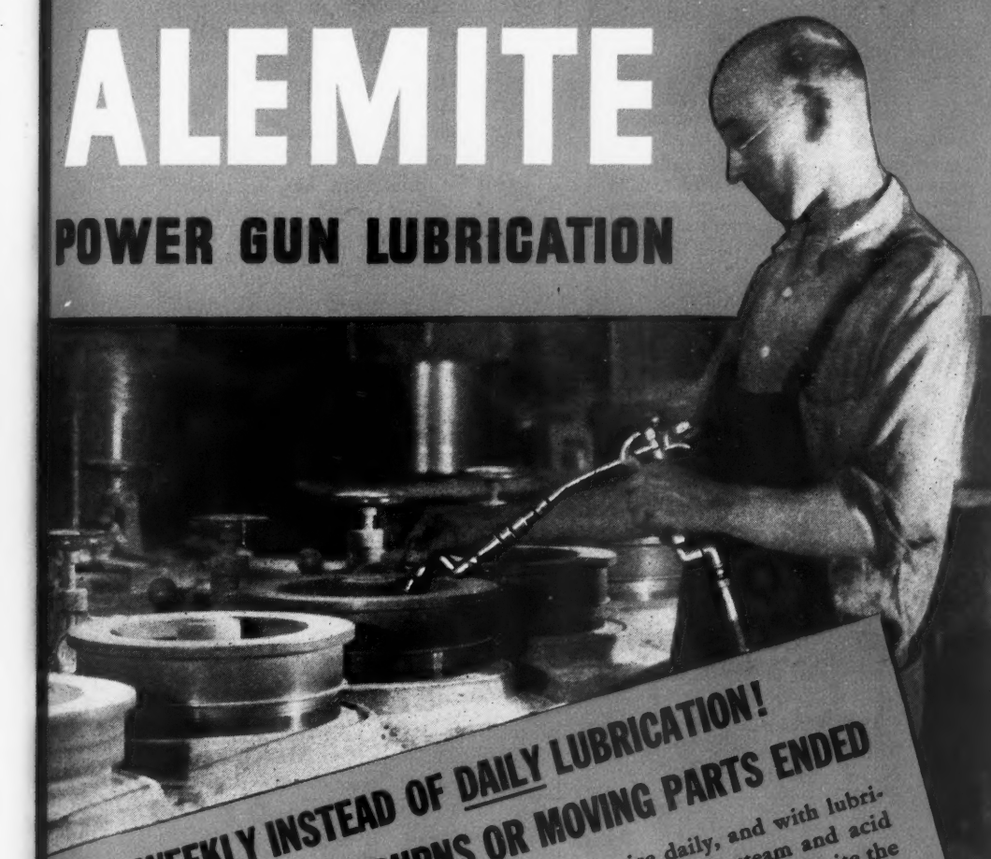
2. To promote and encourage the organization of autonomous groups among

ECONOMY.. SAFETY...

TWIN REASONS WHY THIS PLANT USES

ALEMITE

POWER GUN LUBRICATION



WEEKLY INSTEAD OF DAILY LUBRICATION!
DANGER FROM ACID BURNS OR MOVING PARTS ENDED

"WE USED to oil this machine every day. Now it is lubricated *once a week*, using an Alemite Power Gun and Alemite Lubricant No. 33. Aside from the definite time saving, *the safety factor is important, too.* Danger from acid burns and moving machinery is materially reduced since we adopted Alemite Power Gun Lubrication."

That's the brief story told by L. Muzzy, master mechanic and foreman of the Thompson Wire Company, Worcester. Producing about 30,000 pounds of wire daily, and with lubricant exposed to both steam and acid fumes, this firm has found Alemite the safe, economical answer to lubrication problems.

There is an Alemite System, power or manually operated, *which can cut your operating costs, speed production, and guard your machines against bearing failures.* Easily and quickly installed without interfering with production schedules. Ask us for complete details—no obligation.

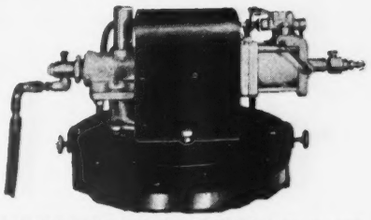
ALEMITE REG. U. S. PAT. OFF.

A Subsidiary of Stewart-Warner Corporation 1870 *Diversey Parkway, Chicago, Ill.*
Stewart-Warner-Alemite Corporation of Canada, Ltd., Belleville, Ontario

WORLD'S LARGEST MANUFACTURER OF LUBRICATION PRODUCTS

ALEMITE BARREL PUMP (*Model 6700*)

For Volume Delivery with High Pressure. Air-operated unit; pumps lubricant direct from 400-lb. drums. Ideal for assembly line lubrication, conveyors, large bearings, and gear housings. Available in various piston ratios. Operates on 75 to 175 lbs. of air. Delivers 6 to 15 lbs. per minute at pressures from 600 to 6,000 lbs. per sq. in., depending on piston ratio and air pressure.



ALEMITE HELICOID PUMP (*Model 6667*)

Pumps Heavy Lubricant. Fits open head 100-lb drum; delivers heavy fibrous lubricant at pressure 33 times available air pressure (100 to 200 lbs.) Agitator at bottom brings lubricant to helicoid or spiral in center column, whence it is drawn into high pressure chamber.

ALEMITE MEASURING PUMP (*Model 6433*)

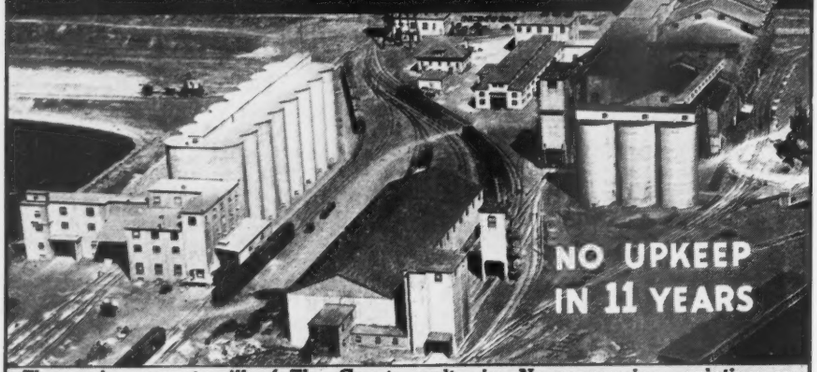
Alemite Measuring Pumps are available in two sizes, Model 6432 delivering up to 6 oz., and Model 6433 up to 16 oz. of lubricant per "shot"—amount determined in advance by setting screw handle at top of pump. Both models operate by hand or foot valve. Both fit into bung of 400-lb. drum, operating on 70 to 100 lbs. of air.

ALEMITE "ROCK CRUSHER" (*Model 6528*)

Air-operated Alemite Power Gun; easily handles heavy lubricants at pressures 33 times air pressure (100 to 200 lbs.) Helix arm and worm in tank pulls lubricant into high pressure cylinder for positive prime and freedom from air pockets. Capacity, 40 lbs. Electric "Rock Crusher," Model 6524, also available.

Careystone CORRUGATED ROOFING AND SIDING

Protects Mammoth Cement Mill Against Weather, Fumes, Temperature



The main cement mill of The Great Lakes Portland Cement Corporation, Buffalo, was roofed and sided with Careystone 11 years ago. This time-defying material, composed of asbestos and Portland cement, is fireproof; cannot rust, rot or corrode; is impervious to weather, chemical fumes and salt air. Never requires painting or other upkeep.

Careystone Corrugated is made in standard sheets 42 inches wide; up to 10 feet long. Quickly, inexpensively applied. For reducing overhead plant costs, investigate Careystone Corrugated. Booklet on request.

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Roofing . . . Flooring . . . Insulations . . . Roof Coatings and Cements
Waterproofing Materials . . . Expansion Joint . . . Asbestos Paper and Millboard

THE PHILIP CAREY COMPANY • Lockland, Cincinnati, Ohio
Dependable Products Since 1873
BRANCHES IN PRINCIPAL CITIES

SHOP ARRANGEMENTS CHANGED LIKE MAGIC

—PRESTO—

With very little work

6 HALLOWELL STEEL WORK-BENCHES

Fig. 732
Pat'd and
Pat's Pending
Drawer is extra

are converted to one long bench

Think of it. With "Hallowell" Benches you can make countless changes in your set-up. Two or more benches can be joined into one smooth continuous working surface or the long bench made into single units. Such flexibility is absolutely impossible where wooden benches are used, for once you tear down a wooden bench all you have left is kindling wood.

Write for facts about "Hallowell" Steel Work-Benches. 1367 combinations to choose from.

STANDARD PRESSED STEEL CO.

BRANCHES: BOSTON, DETROIT, INDIANAPOLIS

JENKINTOWN, PENNA.
BOX 546

BRANCHES: CHICAGO, ST. LOUIS, SAN FRANCISCO

employers and to promote cooperation among such groups and individual employers for mutual counsel and aid in matters relating to labor relations.

3. To promote the recognition and exercise of the rights of employers to bargain collectively.

4. When requested, to assist its members and others in matters relating to the negotiation, execution, and performance of fair labor contracts.

5. To collect, compile, and distribute information and statistics relating to any of the matters mentioned.

6. To sue and be sued, to hold property, make contracts, and borrow money.

Is the last item merely the routine incorporation procedure? Or does it, perhaps, foretell an invitation to Coast unions to incorporate likewise and assume financial responsibility so that they may be bonded for performance of contract—as both unions and employer federations are in Sweden, for example? No announcement on this point has been made, so far, by the Council's sponsors. But the way is open to what may be the most significant aspect of the program.

For Motors That Run Where It's Wet

(Continued from page 71)

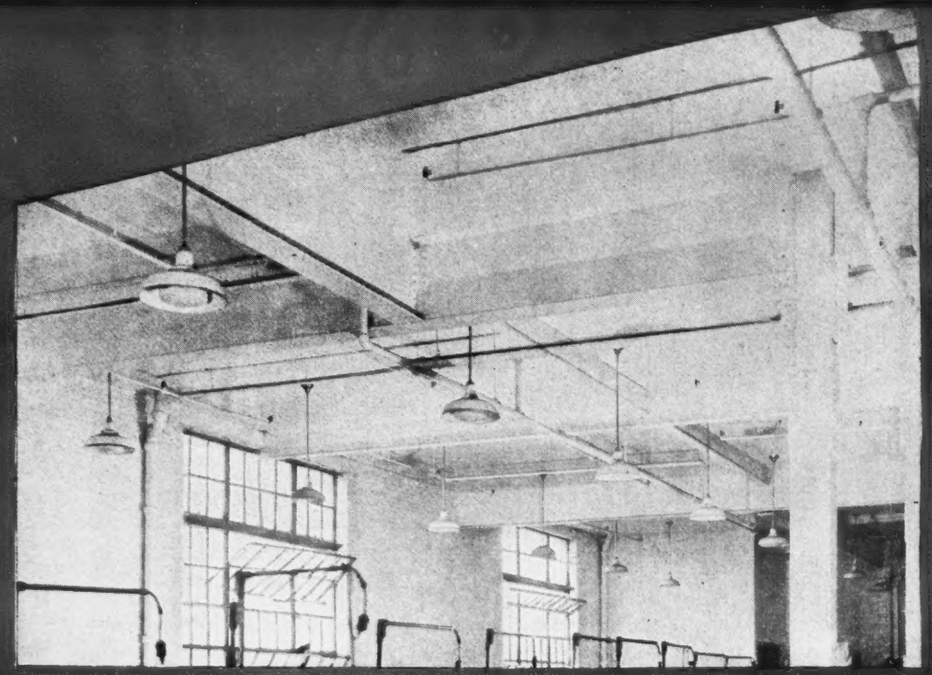
venient removal, a low current can be passed through the windings, or heat can be applied by a fan or blower after inclosing the motor with a canvas cover. When applying heat in this way, provide an opening in the cover for the escape of moisture.

After drying, varnish the coils and leads and thoroughly clean all parts of the motor of dirt which might collect moisture and start corrosion of metal parts.

Protection of control apparatus located in wet places presents a different problem from that encountered with rotating electrical apparatus. Total inclosure permits the use of tight gasketed covers with the contacting mechanism either in air or immersed in oil. Such construction is resistant to moisture, the degree of effectiveness being governed by the care given to the clearances around movable parts, such as pushbuttons and switch handles projecting through the case.

Insulation of the control permits some choice as to location. It can be placed on a wall or pedestal away from dripping ceilings or splashing from the floor. The life of exposed parts is prolonged if they are plated with cadmium, tin, or other corrosion-resistant material. All these precau-

Look at your CEILINGS and WALLS!



Are they playing their part in your Plant's Light Conditioning?

You "light condition" to save money... to speed up work, heighten morale, cut down errors, lower production costs. But is your plant truly, economically light-conditioned? It can't be if your ceilings and walls are dull and dingy ... unpainted absorbers of light!

To make the most of both free daylight and the artificial light you pay for—your first step in light conditioning your plant is white paint. To get the most in highest light reflection, longest-lasting whiteness under the most "difficult" paint conditions in your plant—the white paint you need is Sherwin-Williams Save-Lite!

There's a Save-Lite specially formulated for your plant and the conditions under which it operates. The Sherwin-Williams painting technician will tell you exactly which Save-Lite you need and where in your plant you need it. Let him make a survey. There will be no obligation. Or write for the free Sherwin-Williams "Plant Conditioning Report". Address the Sherwin-Williams Company, Cleveland, Ohio, and all principal cities.

SEE THE SHERWIN-WILLIAMS PAINTING TECHNICIAN

SHERWIN-WILLIAMS SAVE-LITE THE PLANT CONDITIONING PAINT

tions have the effect of increasing insulation life and reducing the danger of creepage and breakdown.

With new equipment the manufacturer should be informed of the conditions under which the control is to operate so that the most suitable type of inclosure, finish, and insulation can be supplied. Special factory finishes include lacquers, varnishes, and paints. They are applied to springs, auxiliary switches, and interlocks. In some instances, finishes having insulating properties are applied. Impregnation of coils with moisture-resistant varnishes is standard manufacturing practice. Corrosion-resisting paints are applied to covers, standards, and supports.

On installation, if there is any choice as to location, dripping water and moisture-laden fumes should be avoided if possible. Proximity to open windows and steam or water pipes should also be avoided. Keep the gaskets in good order at all times and see that inclosures are properly insulated. When necessary renew the finish on parts by applying approved factory varnishes and paints.

If existing machines are to be moved to new locations where they will be subjected to excessive dampness, it may be advisable to purchase new control devices that have been designed for such service. This procedure will oftentimes be found less expensive than attempting to protect the present control from dampness.

Switchgear has about the same advantages as control equipment as regards choice of location, and should be placed in a room where the minimum of moisture and fumes is encountered. The surfaces of the switchboard and associated apparatus tend to condense moisture, causing corrosion, grounds, and short circuits. Installation in close proximity to piping where dripping water may collect, is not good practice.

Factory finishes for apparatus exposed to a moisture-laden atmosphere include special finishes for relays, rheostat mechanisms, undervoltage devices, magnetic locks, circuit breakers, and other parts. They are corrosion-resisting, and by keeping the mechanical parts protected the insulation around conductors and between adjacent parts is protected from the penetration of moisture and the possible formation of a conducting film which might create a creepage path. Panels can be supplied that are resistant to moisture and fitted with bushings, where there is danger of leakage.

Coil impregnation with a special moisture-resistant compound is another aid in the exclusion of moisture from current-carrying parts.

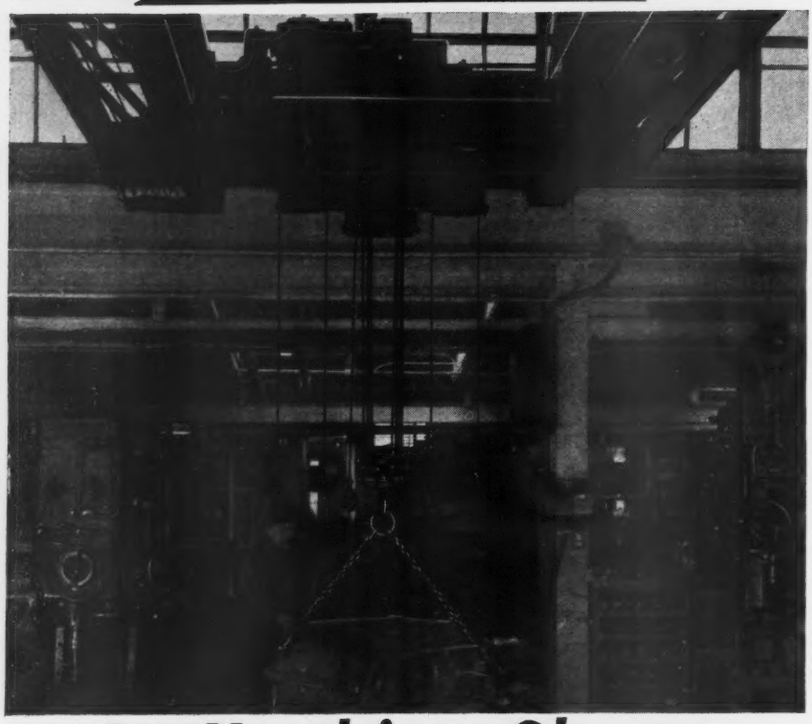
Can Prevent Corrosion

These special features can be supplied by the manufacturer if he is advised of the conditions under which the switchgear is to operate. After installation the maintenance department can, by periodic inspection and the use of good paints, varnishes, and protective coatings on exposed parts, protect the original finish and reduce corrosion to a minimum.

Protection of buses and connections by vaseline or lacquer is of considerable assistance in preventing corrosion of the copper. Care must be taken, however, to keep all such preparations away from contact surfaces and out of the bearings of moving parts.

The ability of moisture to absorb so many harmful compounds, and its tendency when so laden to act as a conductor, make it one of the most important things to be guarded against in cable insulation. In the interest of economy the cross-sectional area of conductors is kept down to the lowest value at which a cable will carry the required current. Hence the

P&H TRAV-LIFT CRANES



In Machine Shops

● The moving of heavy parts around your shop becomes the simple matter of pushing buttons when you use a P&H Trav-Lift. Designed for intermittent service, these units offer you the advantages of low cost, easy operation and great flexibility in handling loads up to 15 tons. They are described in Bulletin H-13. Harnischfeger Corporation, 4525 West National Avenue, Milwaukee, Wisconsin.

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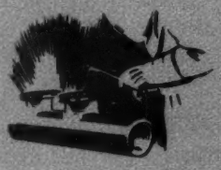
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

Select GRINNELL WELDING FITTINGS

. . . *Eliminate 8 Problems of Welding and Operation*



THIS WELDER meets no complicated problems in building an accurate sub-assembly from seamless pipe and fittings . . . for these are Grinnell Welding Fittings. . . . Four points of welding trouble are *engineered out* in their construction: Their ends match up to standard weight, extra strong or O.D. pipe. They weld easily; their properties are identical with those of seamless pipe. Their welding faces are properly scarfed—45°. Only plain circumferential butt welds are required to join them . . . the easiest of all welds to make.

THIS ENGINEER knows that Grinnell Welding Fittings represent strong links in his piping system, on four counts: Their strength, that results from the seamless pipe or tubing used in their construction, and from their full or greater thicknesses on run or outlet. Their smooth inside and outside surfaces make for free flow through the system. The working pressure-temperature ratings of Grinnell Welding Fittings are identical with those of seamless pipe.

Specify Grinnell Welding Fittings and gain these 8 advantages in your piping system. Catalog 3 gives full details and specifications. Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities.

WELDING FITTINGS BY GRINNELL

WHENEVER **PIPING** IS INVOLVED

insulation is affected by the temperature of the cable on overload.

Temperature changes cause expansion and contraction of the cable and set up stresses in the sections between the joints and in the joints themselves. The insulation must withstand operating temperatures without deterioration, take the stresses induced in the cable, and keep out moisture. The importance of good joints can readily be seen; they are the most vulnerable points in the entire installation.

Types of cable insulation include solid paper, oil-filled paper, varnished cambric, and rubber in many types and combinations. These main types are supplemented by a variety of fillers, tapes, braids, armors, and so on.

Lead-sheathed, paper - insulated cable, both solid and oil-filled, is commonly used for power transmission work and is excellent for wet locations if the joints are carefully made. It is the most difficult kind of cable to install because of the mechanical difficulties encountered and the care that must be taken to seal all joints to prevent the entrance of moisture. Radii specified at the bends must not be exceeded, to prevent unduly straining the insulation.

MODERNIZED LUBRICATION
... Plant AND Product!
The correct oil film to each individual bearing... automatically
"International" Electric Bookkeeping and Accounting Machine
BIJUR
AUTOMATICALLY Correct LUBRICATION
● Far-sighted manufacturers ... such as INTERNATIONAL BUSINESS MACHINES CORPORATION ... are quick to sense the advantages of automatic lubrication. On the International machine, the Bijur Lubricator serves 90 bearings ... helps to keep the machine at full operating efficiency. Again—in their production departments—they find it advantageous to use machines on which Bijur Lubricators are standard equipment. Write for Bijur Bulletin "D."
BIJUR LUBRICATING CORPORATION
LONG ISLAND CITY, NEW YORK
853

Insulating material used in the manufacture of transformers presents a greater problem than the conducting, magnetic, or structural materials, because fewer data are available and the characteristics are more difficult to predict. Both solids and liquids are employed in a great variety of compounds and fillers—solids as strand insulation, separators and barriers, and liquids in the intervening spaces to assist the solid insulation.

When first placing a transformer in service, see that the oil is sufficiently dry for use. When a transformer is shipped, atmospheric conditions in the factory and in transit may not be the same as when it is in actual service, and moisture may enter the case. This is especially true when transformers are shipped without oil in the tank; humidity in the air enters the tank and is absorbed by the insulation. After a transformer has been put in service, periodic checks of the dielectric value of the oil will show whether, and when, it contains too much moisture for safe operation.

Power Distribution

Rubber-covered cable is sometimes employed for transmission work where the peak-load temperatures will not be excessive. This cable is flexible, but ages more quickly than lead-sheathed paper cable, and will not safely carry as high voltages as will the latter.

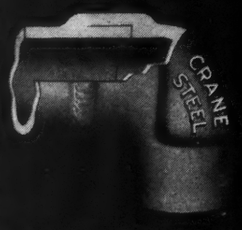
For power distribution, lead-sheathed, paper, rubber-covered, and varnished-cambric-covered cables are the most popular types because of their moisture-resisting qualities. Plant conditions, of course, govern the selection of the most suitable type, but lead-sheathed, paper-covered cable is favored for the primary distribution system, because of its ability to operate at the heavier loads and higher voltages. Rubber-covered cable is favored for secondary distribution, because of its flexibility and waterproof qualities.

For interconnection of apparatus, rubber-covered cable is preferred by reason of its flexibility and lower cost. At the higher voltages, varnished-cambric and paper-insulated cables are favored on account of their longer life. Paper-insulated cable is preferable where load currents are heavy.

Standard distribution transformers are well suited in design and form for use in wet places, by reason of the inclosing features and the absence of moving parts. They have been developed for use in out-of-door as well as indoor locations, and are thoroughly protected.

Extra deep sockets save time—eliminate accurate pipe cutting. Liberal engagement aligns and supports pipe.

Compact and light—yet strong and rugged. Only slightly larger than pipe. Improved band design gives better heat penetration—a better weld.



Run is accurately machined to inside diameter of pipe. Assures smooth, free flow with no pockets when pipe butts against socket shoulder.

Now! BETTER JOINTS

on small lines . . . with Crane's new socket welding fittings

THE new Crane Forged Steel Fittings for socket welding are *not* made from screwed fittings blanks. Engineered specially for welding—for easier installation—*more* efficient and durable service, they permit a *wider* application of welded piping practice.

With these *new* Crane fittings, the advantages of socket assembly are magnified. Socket weld joints for small lines are now *more* practical—*more* economical. Not only are pipe-end beveling and the danger of welding icicles obstructing flow eliminated, but no longer need pipe be cut to accurate length—or even square. Yet, because Crane socket fittings design conforms to advanced welding technique, electric arc or gas, it provides a superior weld—a weld that is stronger than the pipe itself—and in less time.

Crane-Quality stands back of the *greater* efficiency these *new* fittings promise. Crane's extensive research facilities . . . advanced metallurgical engineering . . . 80-year manufacturing experience . . . and Crane's understanding of and ability to fulfill industry's every piping need are *your* assurance that their design is right—and dependable.

Get All the Facts in Bulletin 309

These Crane Socket Welding Fittings mean time-and-money-saving advantages for your plant. Learn why! Illustrated Bulletin 309 gives full *convincing* facts—sizes, ratings, and prices. Your *free* copy is waiting—send the coupon *now!*

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE • PLUMBING • HEATING • PUMPS

CRANE CO., FM&M 3-39
836 S. Michigan Ave., Chicago, Ill.

Gentlemen: I want a copy of Bulletin No. 309—"New and Better Fittings for Small Welded Lines." No obligation, of course.

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City.....*State*.....

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

Sure and Simple Maintenance

(Continued from page 78)

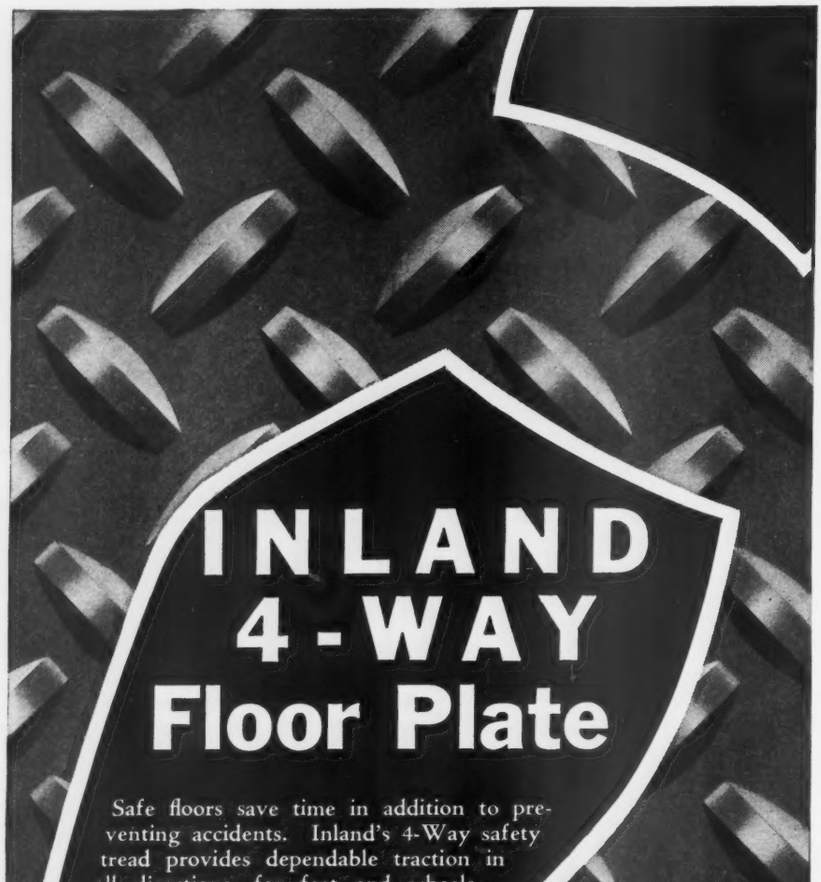
nature, as well as routine inspection and maintenance, written orders and reports are not required. Charges for all such work are handled by assigning an account number for each department and a code number for each operation, of which approximately 600 have been listed.

When work requested by a foreman or department head is estimated to cost more than $50, a written report describing the nature of the work and the reasons for doing it must be sent to the plant manager. If he approves this request, a Request for Maintenance Department Labor form is made out and the work is started. According to our routine all such requests for an appropriation must be approved before work is done, but in this matter the master mechanic is permitted to exercise discretion. Machine rates are high in our plant, and if it is evident that the cost of losses incurred while waiting for approval of an appropriation is likely to be considerable, the master mechanic will go ahead with the work and get the necessary approval afterward.

When making repairs on a machine, say, the workman notes on the back of the work order exactly what was done, and the date of the work. Parts and materials can be drawn from the storeroom only upon presentation of a requisition which is made out in triplicate. The original is retained by the stock-keeper, while one copy is sent to the accounting department and the maintenance department retains the second copy.

Upon completion of a repair job or other work the original of the work order and a copy of all materials and parts requisitions are permanently filed in the individual folder that is maintained for each machine. With this simple system it is possible to determine very quickly the nature and date of all repairs made to any machine.

The workmen record on a simple time ticket the number of hours spent each day on the various jobs handled. These tickets are forwarded to the accounting department where the total hours of work are taken off for the payroll department and then allocated among the various accounts.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4-WAY
Floor Plate
Safe floors save time in addition to preventing accidents. Inland's 4-Way safety tread provides dependable traction in all directions, for feet and wheels. No plant can be efficient with bad floors. Make yours right for years to come with Inland 4-Way Floor Plate.
Order from your Jobber or write for 16-page Floor Plate Booklet
INLAND STEEL CO.
38 SOUTH DEARBORN STREET, CHICAGO
Sheets • Strip • Tin Plate • Bars • Plates • Structurals • Piling • Rails • Reinforcing Bars

They Blamed the Motors

(Continued from page 82)

it is quite possible that changing these machine resistors for the fan type will do the trick."

And it did.

Granted proper selection and installation, a fair proportion of the trouble experienced with motors and controls is caused by ignorance of the maintenance attention required, or neglect to provide it.

"Something is wrong with those motors," declared the superintendent of a cotton spinning mill, pointing to a long row of textile motors mounted on the ceiling and belted down to the spinning machines. "They run too hot. Actually burn out occasionally."

"Maybe they are carrying too much load," the salesman suggested. "Have you tested them?"

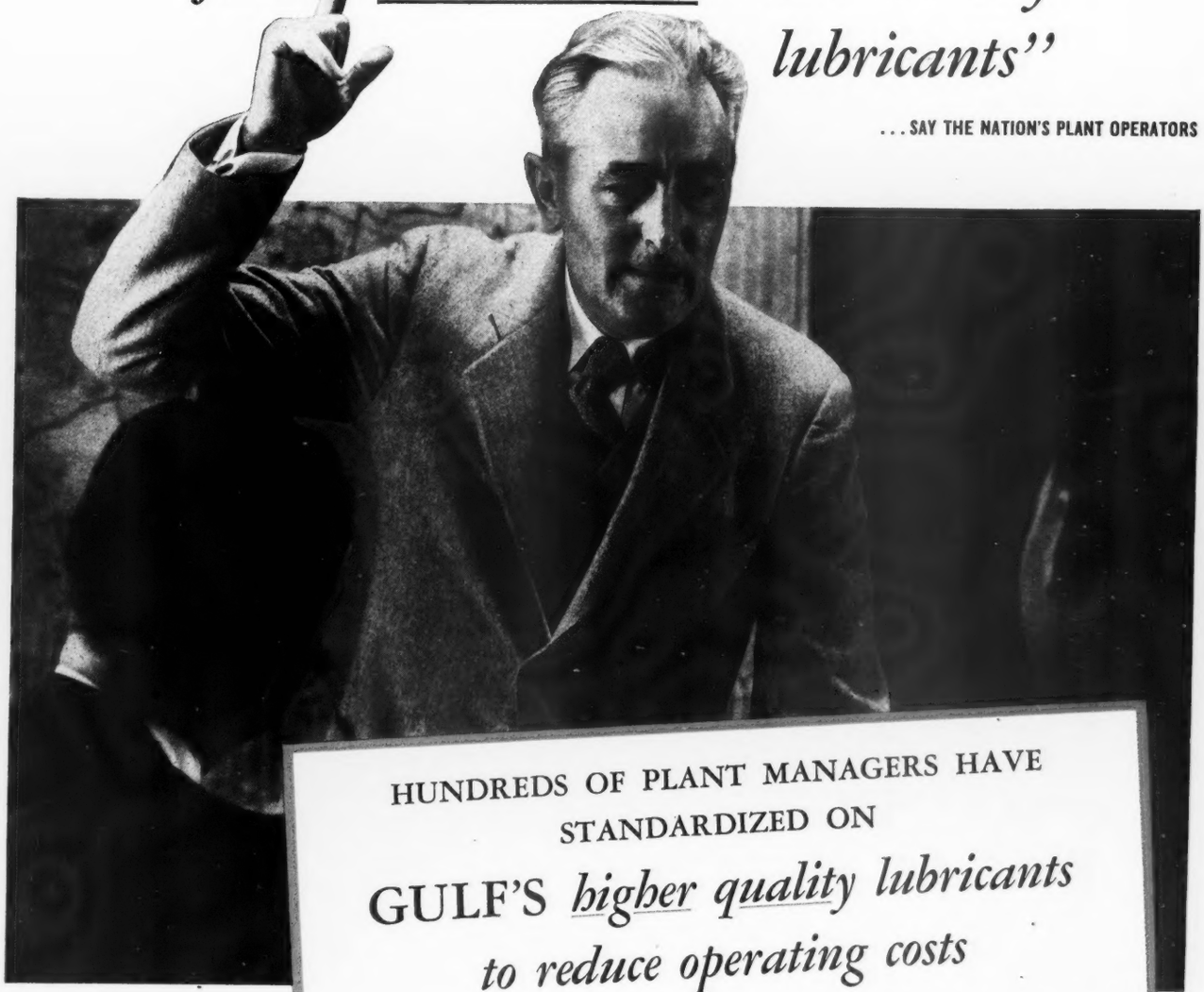
"Sure we've tested them. They are running at 89 per cent of their rated load. That is surely not an overload."

"No, but you say that they run hot. Let's take a look at one."

The salesman climbed up and put his hand on one of the motor frames. "Yes, it's much hotter than it ought

"QUALITY *is our first consideration when we buy lubricants"*

...SAY THE NATION'S PLANT OPERATORS



HUNDREDS OF PLANT MANAGERS HAVE STANDARDIZED ON

GULF'S *higher quality lubricants to reduce operating costs*

A famous fact-finding organization recently asked several hundred industrial oil buyers this question: "What considerations led you to purchase the brands you are now using?" A few said "price," *but a great majority answered* "QUALITY."

There is just one fundamental reason why an increasing number of plant operators are buying lubricants on a quality basis. It is this: *Proper lubrication has a far-reaching influence on the important costs of plant operation.* When plant men learn how good oils and greases can help them improve production, reduce maintenance costs and cut power bills, they demand lubricants of highest quality to help them operate on a profitable basis.

That is why a versatile group of highly skilled technical men works each day in the Gulf Laboratories to perfect better lubricants — to raise the quality standards for oils and greases. Through their unceasing efforts, Gulf is able to offer industry a complete range of more than 400 oils and greases of highest quality. These finer lubricants are helping hundreds of plant managers operate their machinery more efficiently.

There is a *real quality story* behind Gulf oils and greases. Let a Gulf engineer demonstrate to you — in your plant — how Gulf's higher quality lubricants provide a greater measure of protection for your machinery and help you reduce the costs of plant operation. Gulf Oil Corporation — Gulf Refining Company, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

to be on less than full load," he admitted. "How about ventilation?"

"They have fans to take care of that. If those motors don't get proper ventilation, it's their fault," the superintendent declared with finality.

"Not necessarily. How often do you clean them?"

"They are taken down and thoroughly cleaned and oiled twice a year. That ought to be enough if they are all right."

"And during each six-month period you let the lint pile up until, as now, the ventilating openings are so clogged that no air can get into the frames. The fans are just churning hot air over and over. That's not ventilation."

After that the superintendent saw to it that the lint was not allowed to accumulate in any quantity, and there was no more trouble with overheating.

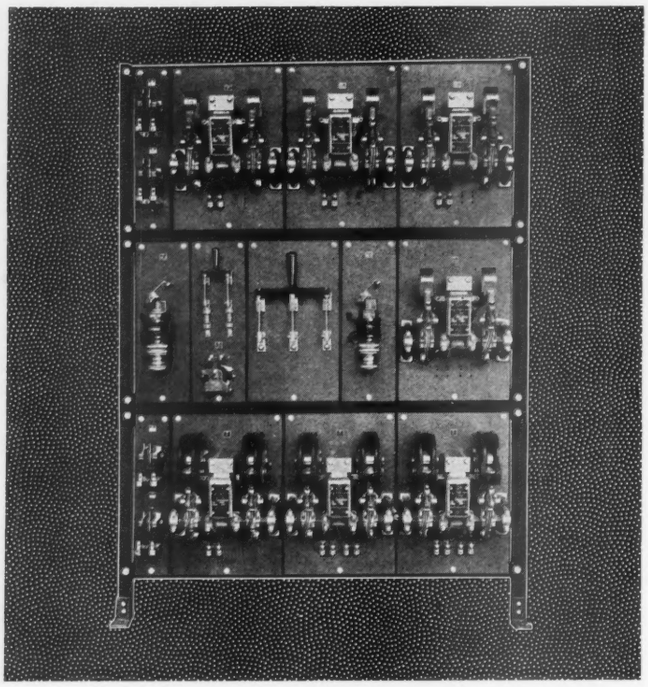
Sometimes the real cause of trouble with motors is so simple that the maintenance man overlooks it in his earnest search for something big and important.

By way of example, a motor in one plant threw so much oil from the bearings that the oil soon became exhausted and there was real reason to fear that without almost constant watching the shaft would freeze, or the bearings fail. The maintenance man declared that the design of the oiling system was no good. He had taken the shaft out, examined the rings, and done all of the hard-to-do things he could think of, but as soon as the motor was put back in service it threw oil and heated up just the same as before. Then a common workman who knew nothing about motors or controls casually asked him whether the oil drain cock was closed tightly. It wasn't.

In the same plant another case of bearing trouble resulting in serious heating stumped the maintenance man for a while. This time the drain cock was tightly closed; he made sure of that the first thing. Much checking and testing failed to disclose any mechanical defects. Eventually he discovered that the oil with which his helper was faithfully filling the bearings was drawn from the lard oil barrel in the stockroom. It took him some time to convince the helper that oil is not necessarily oil even though it is oil. At least that is the way he put it, and he got the idea over, at last.

When the motor was supplied with a suitable lubricant, it cooled off and settled down to the humdrum existence that permits maintenance men to sleep nights.

Quick-Stop-by-Plugging
for A. C. Wound Rotor Motors



EC&M Frequency Relay Magnetic Control provides a new, highly efficient method of operation for this type of drive. Frequency relays regulate acceleration automatically, cutting out rotor resistance only when it is necessary to maintain motor torque at its pre-determined value. And a frequency relay of the same type as used for acceleration but designed to operate exactly at the zero-speed frequency is used to open the reverse torque contactor at the instant the motor comes to rest. This is a distinct forward step in quick-stop-by-plugging control.

THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS

THE ELECTRIC CONTROLLER & MFG. CO.
2688-F East 79th St., CLEVELAND, OHIO

Gentlemen:

Please send me further information on Quick-stop-by-plugging Control for a .... HP .... Volt .... phase .... cycle wound rotor motor.

NAME.....

COMPANY.....

ADDRESS.....

Something New In Welding

(Continued from page 84)

While the smallest of the three welding heads available can be guided by hand, most installations require a rigid supporting structure, and suitable positioning and traversing equipment must be provided if the automatic control features mentioned above are to be incorporated. On the other hand, equipment need be no more complicated than that used for other automatic welding processes. The welding head can be mounted either on a stationary support under which the work is moved, or on an overhead, gantry, or wall crane, or a portable carriage or other support that travels over the work.

The largest head, for heavy production welding, feeds rods of any size up to ½-in. diameter, handles current up to 4,000 amp., and welds 3-in. steel plate in one pass. The smallest head feeds up to ¼-in. rod, currents up to 1,000 amp., and welds ½-in. steel in one pass. There is one intermediate size.

Coiled welding rod is fed from

International Harvester ANNOUNCES A 70 H.P. DIESEL TRACTRACTOR

These Features Mean Efficiency, Low Cost, Long Life

1. Six-cylinder full Diesel engine.
2. Engine is started easily from the operator's seat.
3. Six forward and two reverse speeds.
4. Automatic clutch brake for fast gear shifting.
5. Easiest steering crawler tractor built. Power-actuated steering clutches.
6. Steering levers and pedals adjustable to suit operator.
7. Pivot shaft relieved of twisting stresses, and tracks kept in alignment, by ball-and-socket outer pivots, diagonal-arm inner pivot bearings, and roller stabilizer.
8. Track shoes keyed to track links to prevent loosening of shoes.
9. Triple-gear oil pump. Full-pressure engine lubrication at all working angles.
10. Positive track roller lubrication at all speeds. Quintuple-sealed track rollers have patented gravity lubrication at low speeds and pressure lubrication at high speeds. Oil and dirt seals on both sides of sprockets. Self-cleaning idler wheel.
11. Tocco-hardened crankshaft with replaceable main and connecting rod bearings.
12. Unit construction. Each steering brake, steering clutch, track frame assembly, and other units, adjusted or replaced without disturbing adjacent parts.
13. Famous TracTracTor accessibility. More productive hours, low maintenance cost.
14. Allied equipment engineered for the TD-18 by well-known manufacturers.

HERE is real news that operators of heavy-duty mobile power have long been looking for: International presents a new 70 h.p. (*drawbar*) Diesel TracTracTor, extending the benefits of International design and performance to a much broader field.

In this latest product you will find the sound engineering and precision manufacture that is well-known to all users of TracTracTors—*plus advanced design, many patented features and improvements.* The flexible adaptability of the TD-18, with its 6 forward and 2 reverse speeds, will be a surprise, whatever your experience up to this time.

Equipment especially designed for use with the TD-18 includes **SCRAPERS, BULLDOZERS, BULLGRADERS, ROAD GRADERS, WAGONS, SNOW PLOWS, WINCHES, LOGGING ARCHES.** Company-owned branches and International industrial power dealers will tell you all about the features of the International TD-18 TracTracTor.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 NORTH MICHIGAN AVENUE CHICAGO, ILLINOIS

INTERNATIONAL POWER *is made by the makers of* **INTERNATIONAL TRUCKS**

reels that are either mounted on the head or on the supporting equipment. There is an exception in the case of the small head which feeds only straight lengths of rod 6 to 8 ft. long.

Single-phase alternating current is most frequently used for this type of welding; direct current can also be used. Open-circuit voltage of 85 to 100 is required for the thickest welds, but 60 volts open circuit can be used with currents up to 1,800 amperes. The actual voltage at the welding zone, adjusted through the voltage control, is approximately 30 to 50 volts, depending on type and size of weld. Of course sufficient adjustable reactance or resistance, depending on whether a.c. or d.c. is used, is necessary to permit current control during the welding operation.

Transformers in units of 1,000 amp. capacity are generally employed, although smaller and larger units may be used. If high current is needed, it may be necessary to connect two or more units in parallel. Direct-current welding generators may also be used with their output circuits connected in parallel.

Whether a.c. or d.c. is used, a means of remote control for the welding current must be provided. If it is to be a.c., a magnetically operated contactor capable of breaking the entire welding current is required. When d.c. is supplied from generators, a magnetically operated contactor, capable of breaking the entire welding current is required.

In several large installations, the welding head is suspended from the crane or carriage, usually on a mast about which the head can be rotated. Current and voltage controls are mounted on the crane bridge, and the transformers or generators are either fixed to the crane or mounted apart from it and connected by busbar or flexible cables to the controls.

● Steel Mill engineers laid down the specifications for an ideal ram truck, to embody all the requirements of the modern strip mill for efficiency, safety, and economy. Baker designed and built the Type JO-150 specifically to meet these exacting requirements. It sets new standards of performance for steel handling equipment—and emphasizes once more the fact that *handling costs can be and are being cut with Baker trucks.*

Model JO-150, capacity 15000 lbs., 540,000 inch lbs. Wheelbase 73", outside turning radius 115 inches. Turns with maximum coil in intersecting aisles 104 inches wide. May be furnished tilting or non-tilting. Tractors of similar design are available in capacities from 8000 lbs. to 30,000 lbs.

Features included in this new ram truck are power steer, full contactor control with automatic acceleration, frame of high carbon steel plate, hydraulic wheel brakes, strongest drive axle ever used, easiest accessibility to all units.

OLDEST MANUFACTURER Baker OF ELECTRIC VEHICLES

BAKER INDUSTRIAL TRUCK DIVISION
OF THE BAKER-RAULANG COMPANY
2178 WEST 25TH STREET • CLEVELAND, OHIO

Public Relations: Industry's Biggest Job

(Continued from page 67)

employee's deposit in relation to total employees' deposits.

Said M. H. Karker, Jewel's president, in his announcement of the plan:

"The principle of profit sharing with the executive and supervisory force of the company has been in operation for fifteen years and has proved itself successful and in the interest of the stockholders. When the extension of that principle to the whole group of working men and women in the business was first considered some four or five years ago, it was approached as an act of social consciousness and thought of as worth the doing because it was right, decent, fair, and within the financial capacity of the corporation and its owners. The more the proposal was studied and developed, however, the clearer it became that it should not be done solely for these reasons, but that it should be done in the interests of the stockholders themselves. It is my considered judgment and belief that this plan is a further aid in insuring future continuity and profit and that more profit in dollars will be produced for stockholders with the plan than would be produced under the same conditions without the plan."

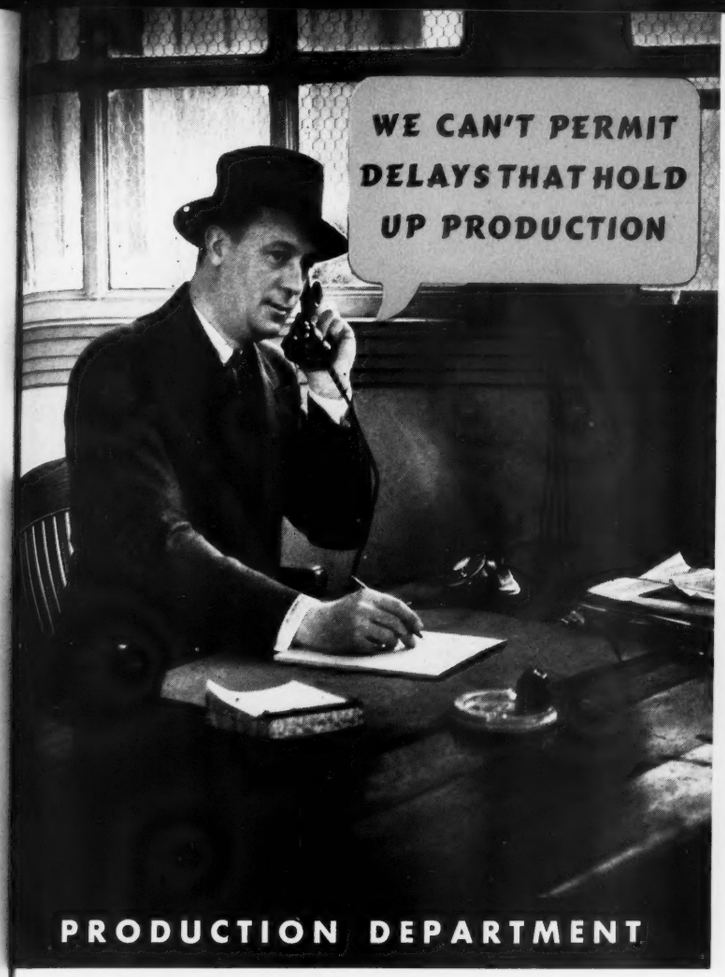
[For additional information regarding Jewel Tea practices see "Paid a Bonus in This Year 1934," October, 1934.]

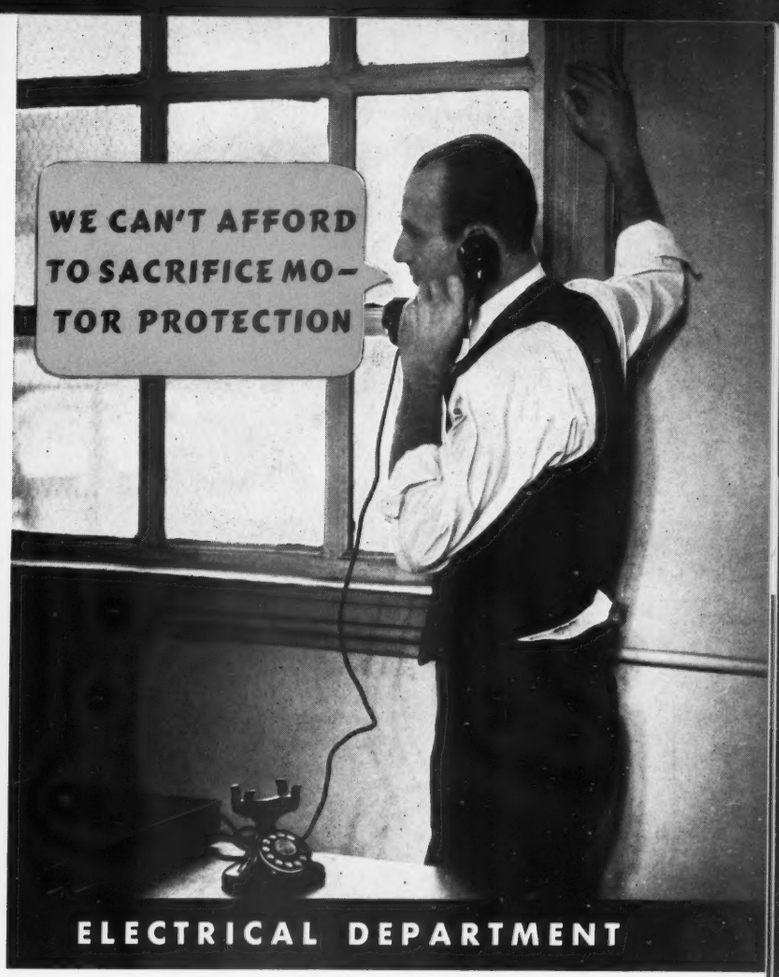
TRADE LITERATURE

Contour Sawing Machine — Folder. "Doall" contour machine is a combination of toolroom lathe, milling machine, shaper.—Continental Machine Specialties, Inc., 1301 Washington Ave., S., Minneapolis.

Conveyors—Revised edition of booklet, "Natural Laws Applied to Production." Application of the principle of "continuous flow" to materials handling in industry. Pictures and diagrams of installations.—Mathews Conveyer Co., Ellwood City, Pa.

(Continued on page 136)





G-E ISOTHERMIC CONTROLS *Satisfy Both*

THE production manager is right—certainly his company can't afford to have equipment shut down and men waiting around every time some motor has a tough job.

The electrical superintendent is right, too—he's saving his company money by insisting that motors be protected from overloads that might endanger windings or bearings.

If the motors are equipped with G-E controls, neither department needs to worry. Isothermic overload relays protect motors from dangerous overheating, yet they keep them on the line as long as they can be safely operated.

G-E motor starters meet the approval of electrical and production departments in other ways, too. They are sturdy—built to stand the gaff of industrial service with little maintenance and attention.

More and more plants are standardizing G-E magnetic control for all important motor drives because it satisfies the requirements of both the production and the electrical departments.

The general-purpose CR7006—standard control for motors in thousands of plants

▲ The CR7009 magnetic reversing controller for the push-button reversing of motors

◀ The CR7008, which combines magnetic control with a fused manual line switch in the same case

General Electric, Dept. 6B-201
Schenectady, N. Y.
Please send me copies of your literature on:
CR7006 Magnetic Starters
CR7008 Combination Switches
CR7009 Reversing Switches

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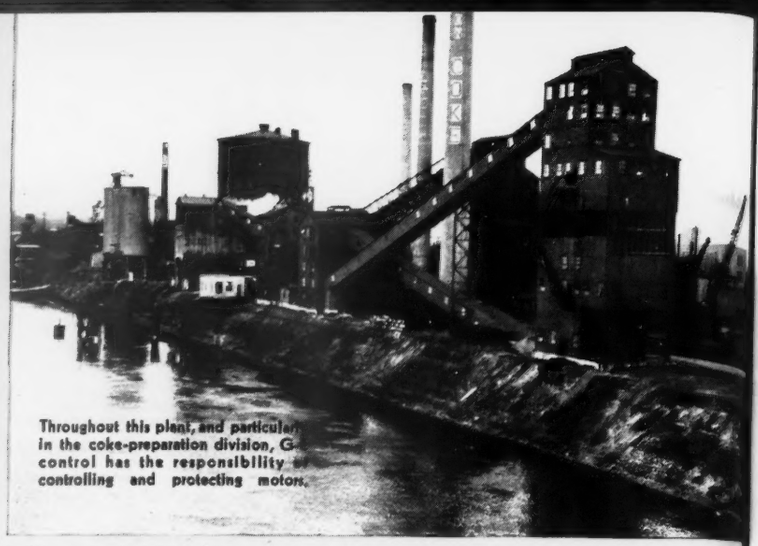
GENERAL ELECTRIC

At Hudson Valley Fuel Corporation The 45 G-E Controls

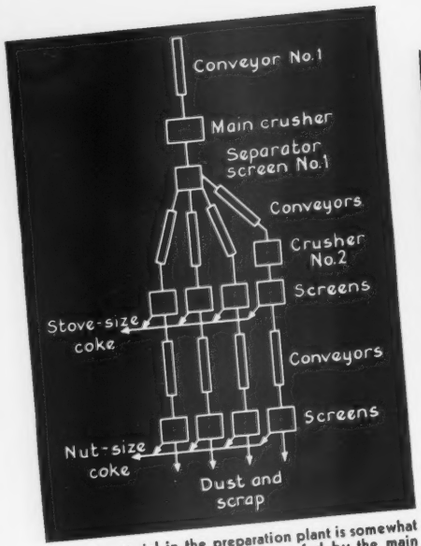


Throughout this plant, and particularly in the coke-preparation division, G-E control has the responsibility of controlling and protecting motors.

"Prevent Needless Interruptions"

Says Mr. R. G. Ross, Electrical Superintendent

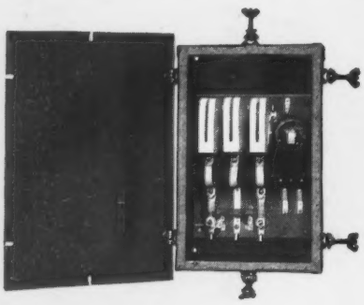
Mr. R. G. Ross, Electrical Superintendent, says, "It is our experience that G-E controls adequately protect motors against overload, but prevent needless interruptions to production."



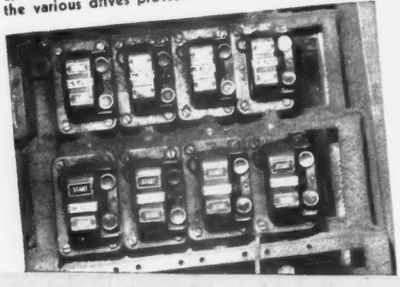
Flow of material in the preparation plant is somewhat like this. Three processing lines are fed by the main crusher. Controls are interlocked so that in case any motor stops, all motors sending material to that unit will automatically stop, to prevent jams that might endanger equipment and require clearing.

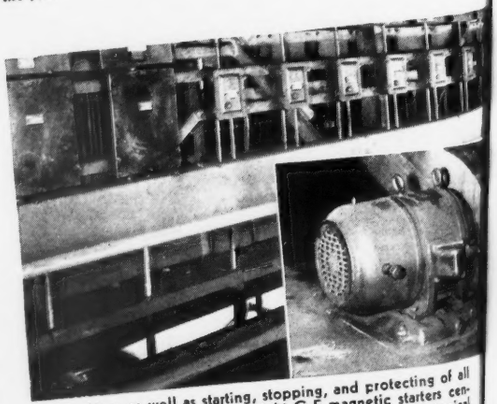
A bank of 45 G-E dust-tight push-button stations, also on the control balcony convenient to the operator in charge, enables him to start or stop any crusher, screen, or conveyor. Duplicate stations near the various drives provide for emergency stopping.

In the preparation division, where 1200 tons of coke from the ovens are crushed, screened, and loaded daily, 45 motors supply the power. Forty-five G-E motor starters are on duty — helping to supervise the job.



Here are a G-E dust-tight magnetic starter, opened for inspection, and a typical G-E dust-tight push-button station. Controls similar to these are used at coke plant.





Interlocking, as well as starting, stopping, and protecting of all motors is done by the 45 dust-tight G-E magnetic starters centrally located on the control balcony. Insert shows a typical motor driving a conveyor.

GENERAL ELECTRIC

080-168

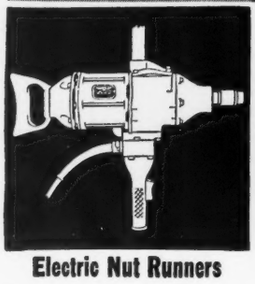
BLACK & DECKER

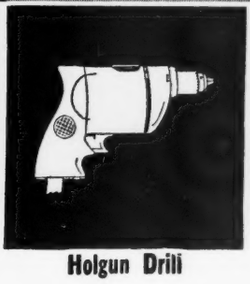
World's Largest Manufacturer of Portable Electric Tools

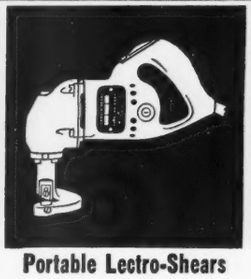
Adaptable to Dozens of Uses

For industrial use, this brand new Black & Decker 5/16" Utility Drill fills a long-felt need. Versatile to the "*n*th" degree, this remarkable drill has the added chuck capacity that permits the use of many varieties of twist drills and other accessories for drilling, grinding, countersinking and wire brushing on wood, metal, stone, and other surfaces.

Can be used for production work; maintenance use or in a bench drill stand for more accurate work. In short, here is the ideal "all-around" industrial drill. Perfectly balanced, ruggedly built and highly powered. And because its versatility goes beyond other drills in the same price class, you can't afford to be without this 5/16" Utility Drill. Call your Jobber today for a demonstration; or write to us for details. The Black & Decker Mfg. Co., 719 Pennsylvania Ave., Towson, Md.


Electric Nut Runners


Holgun Drill


Portable Lectro-Shears

Utility Power Drills

Bench Grinders

(Continued from page 132)

Conveyor — Catalog. "Hydroveyor" pneumatic conveyor for handling fly ash, soot, dust, and coal siftings.—United Conveyor Corp., 37 West Van Buren St., Chicago.

Die Castings—Reprint. "Die Cast or Stamped." Analysis includes costs of parts made by both methods.—The New Jersey Zinc Co., 160 Front St., New York.

Dust—Form 2035. "Dust Hog" as a racketeer — remedy: dust collector. — Pangborn Corp., Hagerstown, Md.

Electrical Control Apparatus — 1939 Catalog. "Trumbullist." Listings and prices.—The Trumbull Electric Mfg. Co., Plainville, Conn.

Equipment, Miscellaneous — Leaflet. First of 12 descriptive leaflets on the various types of products made by the company.—Allis-Chalmers Mfg. Co., Milwaukee.

Expansion Joint — Bulletin X-39-5. Stainless-steel bellows, packless expansion joint.—Foster Wheeler Corp., 165 Broadway, New York.

Filters—Booklet. "80 Ways to Make More Money." Filters in process, power, and heavy industries.—Cuno Engineering Corp., Meriden, Conn.

Flame Cutting Machine—Catalog. Information on the Hayes torch machine. —Hayes Track Appliance Co., Richmond, Ind.

Geared Motor Reducers — Leaflet 2203-B. Speed reducers for low-speed operation. Line drawings and photographs of installations.—Allis-Chalmers Mfg. Co., Milwaukee.

Geared Motor Reducers—Descriptive Data 3610. Single, double, triple reduction geared motor reducers.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Geared Drives — Bulletin B. 2159. Uses, adaptations, and developments of types of geared drives.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Heating Surface — Catalog 229-1. Method of uniform steam distribution applied to blast heating surface. Dual steam-distributing tubes.—John J. Nesbitt, Inc., Holmesburg, Philadelphia.

Hose — Catalog G-14. Illustrations and engineering data on "Rex-Weld" corrugated metal hose, "Rex-Tube" asbestos-packed hose. — Chicago Metal Hose Corp., Maywood, Ill.

Instruments—Catalog N-95-163. "Micromax" instruments for determining condensate purity in steam plants, method of measurement, and typical applications.—Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia.

Lamp Control Units—Catalog Section 61-275. Fluorescent lamp control unit. —Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J.

Lamps—Catalog. Fluorescent lamps. Inspection and drafting table units.—Wheeler Reflector Co., 275 Congress St., Boston.

Lathes—Folder. Back-geared, screw-cutting precision lathes.—Sheldon Machine Co., Inc., 3253-55 South Cottage Grove Ave., Chicago.

Lighting—Treatise. "The Meaning of the RLM Label" in the specification and purchase of industrial lighting equipment.—RLM Standards Institute, Inc., Room 1130-20 North Wacker Drive, Chicago.

Lighting—Folder. "Vent-O-Lite" skylight for natural light and ventilation.—Vent-O-Lite Co., 4230 West Taylor St., Chicago.

Machine Tools—Catalog 39. Seventy-two-page catalog on 7-in. shapers, drill and arbor presses, lathes, vises, motors, and grinders, machinists tools.—Atlas Press Co., Dept. 7, Kalamazoo, Mich.

Metal—Bulletin. Physical structure of "Glyco" babbitt metal. Illustrations showing homogeneity and quality.—Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago.

Motors—Bulletin 1195. Squirrel-cage induction motors in operation under adverse conditions.—Allis-Chalmers Mfg. Co., Milwaukee.

Motors—Bulletin C-4. P&H heavy-duty d.c. mill motors.—Harnischfeger Corp., 4400 West National Ave., Milwaukee.

Motors—Bulletin 515. Motor application chart lists 26 types of motors and checks the proper type for about 50 standard applications.—The Louis Allis Co., Milwaukee.

Motors—Bulletin 610. NEMA standards and definitions.—The Louis Allis Co., Milwaukee.

Motors—Booklet B. 2164. How to select a synchronous unit for application. Typical torque requirements.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Nuts, Bolts, Screws—Catalog. Revised price list.—Remington Screw & Bolt Mfg. Co., Inc., Cold Spring-on-Hudson, N. Y.

Paper Making—Bulletin B. 2156. Use of "Micarta" in paper making machinery.—Westinghouse Electric & Mfg. Co., Micarta Div., Trafford, Pa.

Pipe and Bolt Machine—Bulletin C. Model C portable power unit in bench or stand types.—Beaver Pipe Tools, Warren, Ohio.

Potentiometer Controllers — Bulletin 202-2. Temperature controllers for iron and steel, glass, ceramics, chemicals manufacture.—The Foxboro Co., Foxboro, Mass.

Printing—Folders. 156: Model A automatic high-speed white print machine. 157: Model D office-size white print machine. 158: Model E white print machine for average print requirements.—Ozalid Corp., 354 Fourth Ave., New York.

Pumps—Catalog L-31. Rotary displacement pumps for handling fuel and crude oils, lubricating oils, and hydraulic oil.—De Laval Steam Turbine Co., Trenton, N. J.

Pumps—Folder W-341-B2. Saddle-mounted, vertically split centrifugal pump, Type H.—Worthington Pump & Machinery Corp., Harrison, N. J.

Pumps—Form W-450-B19C. Deep

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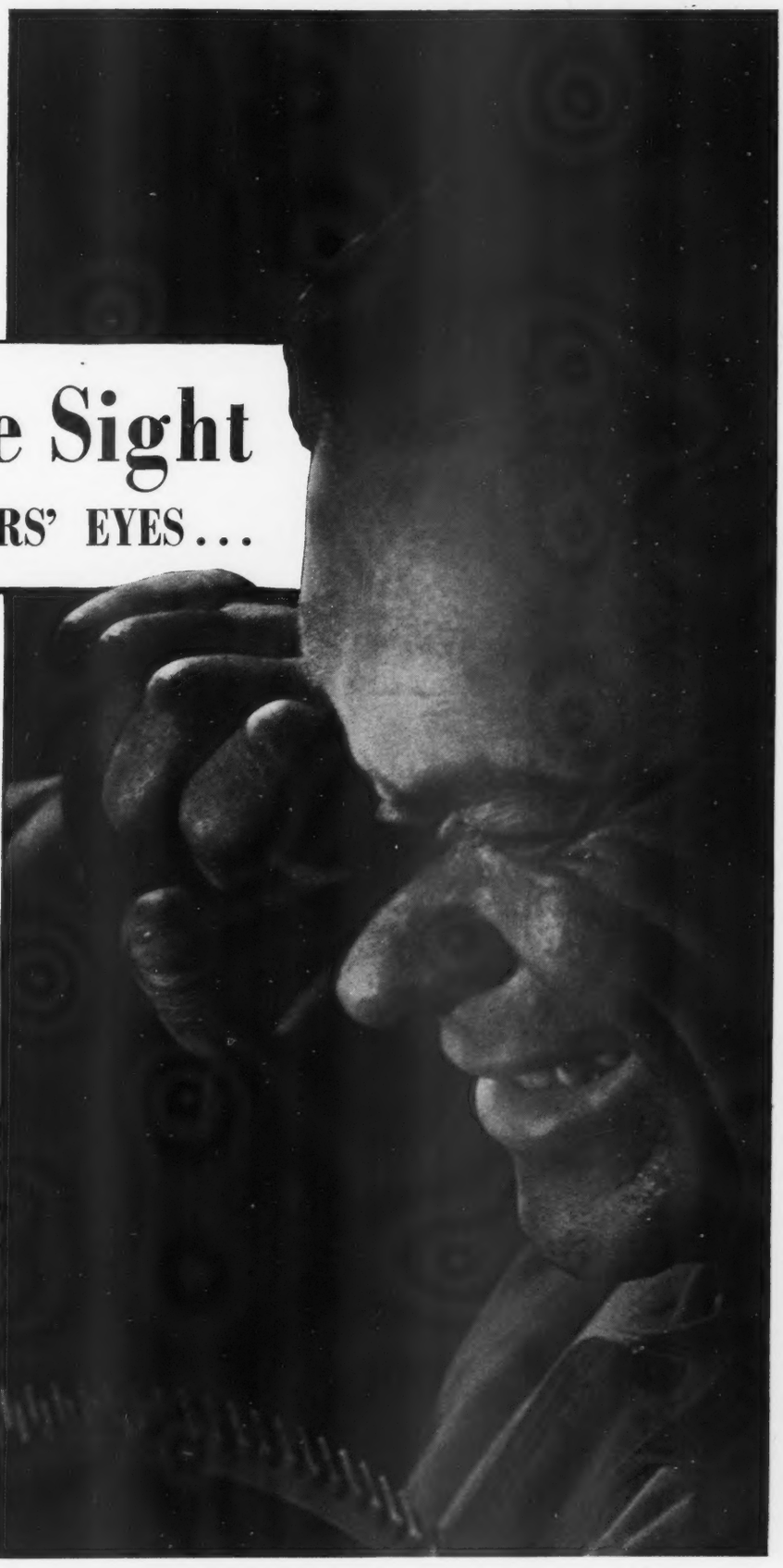

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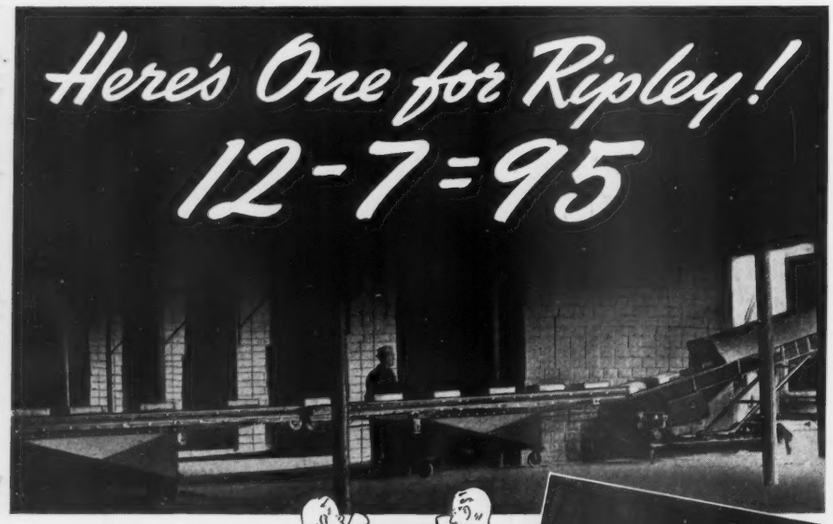

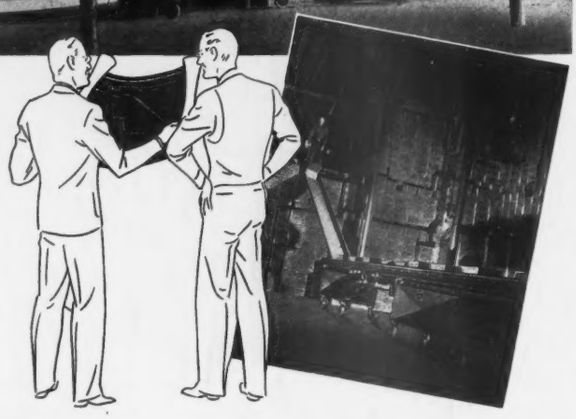

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well turbine pumps, Types QE and QAE. —Worthington Pump & Machinery Corp., Harrison, N. J.

Pyrometers—Catalog 1452. Line of "wide-strip" pyrometer recorders and controllers. Details on thermocouples and charts with ranges available.—The Bristol Co., Waterbury, Conn.

Pyrometer—Folder DMF 765. Potentiometer indicating recorder-controller—new features and specifications.—The Foxboro Co., Foxboro, Mass.

Rectifiers—Leaflet 2343. Small-capacity, evacuated, glass bulb rectifier units.—Allis-Chalmers Mfg. Co., Milwaukee.

Reseater—Folder. Precision tools for renewing seats in seat-type valves.—Standard Reseater Corp., 423 West 126th St., New York.

Respirators—Folder. "Dupor" double filter respirators.—H. S. Cover, South Bend, Ind.

Rod Straightener—Catalog. Sizes and types of rod straighteners—construction details, specifications, and operating data.—The American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind.

Roof Trusses—Folder. Standards and specifications of Summerbell trusses.—Summerbell Truss Co., 4230 West Taylor St., Chicago.

Shoes—Catalog. Forty-one steel-toe safety work shoes.—Lehigh Safety Shoe Co., Allentown, Pa.

Speed Reducers — Descriptive Data 3620. SH and DH speed reducers. Illustrations and standard ratings.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Starter—Folder. "Neo-Time" method of timing acceleration for a.c. and d.c. motors.—The Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland.

Starters—Bulletin B-2131. Combination linestarters consisting of "De-ion" linestarter and "Nofuze De-ion" circuit breaker.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Starters—Price List 11-200. "De-ion" non-reversing linestarters with built-in control-circuit transformers.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Steel—Bulletin. Oil-hardening alloy steel.—Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago.

Steel Surfacing—Bulletin 7-6-D. "Dip Granodizing" creates a rust-resisting paint-retaining surface on steel.—American Chemical Paint Co., Ambler, Pa.

Steel Surfacing — Bulletin 7 - 10 - S. "Spray-granodizing" provides a rust-resisting, paint-retaining surface on steel. —The Amercan Chemical Paint Co., Ambler, Pa.

Stencil - Cutting Machines — Catalog. "Shippers' Handy Helper" contains information on shipping problems, supplies, and devices.—Diagraph-Bradley Stencil Machine Corp., Inc., 3745 Forest Park Blvd., St. Louis.

Stokers—Catalog 350. Diagrams and illustrations of construction and installations of automatic "LoStokers."—Detroit Stoker Co., General Motors Bldg., Detroit.

Switches—Bulletin 33-B. Data on disconnecting switches and fuse mountings.—Delta-Star Electric Co., 2400 Block, Fulton St., Chicago.

Switchgear — Booklet GEA-2872. Metal inclosed switchgear, types, applications, voltage and interrupting ratings.—General Electric Co., Schenectady, N. Y.

Thermometers—Catalog 1170. "Tag" dial-indicating thermometers. Equipment and installations.—C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y.

Thermostats—Bulletin TM. "Microstat" thermostats for direct operation of magnetic gas valves, stoker controls, relay sets, solenoid refrigerant valves, damper motors.—Julien P. Friez & Sons, Baltimore.

Thermostats—Bulletin TS. Heavy-capacity wall, oven, and industrial thermostats.—Julien P. Friez & Sons, Baltimore.

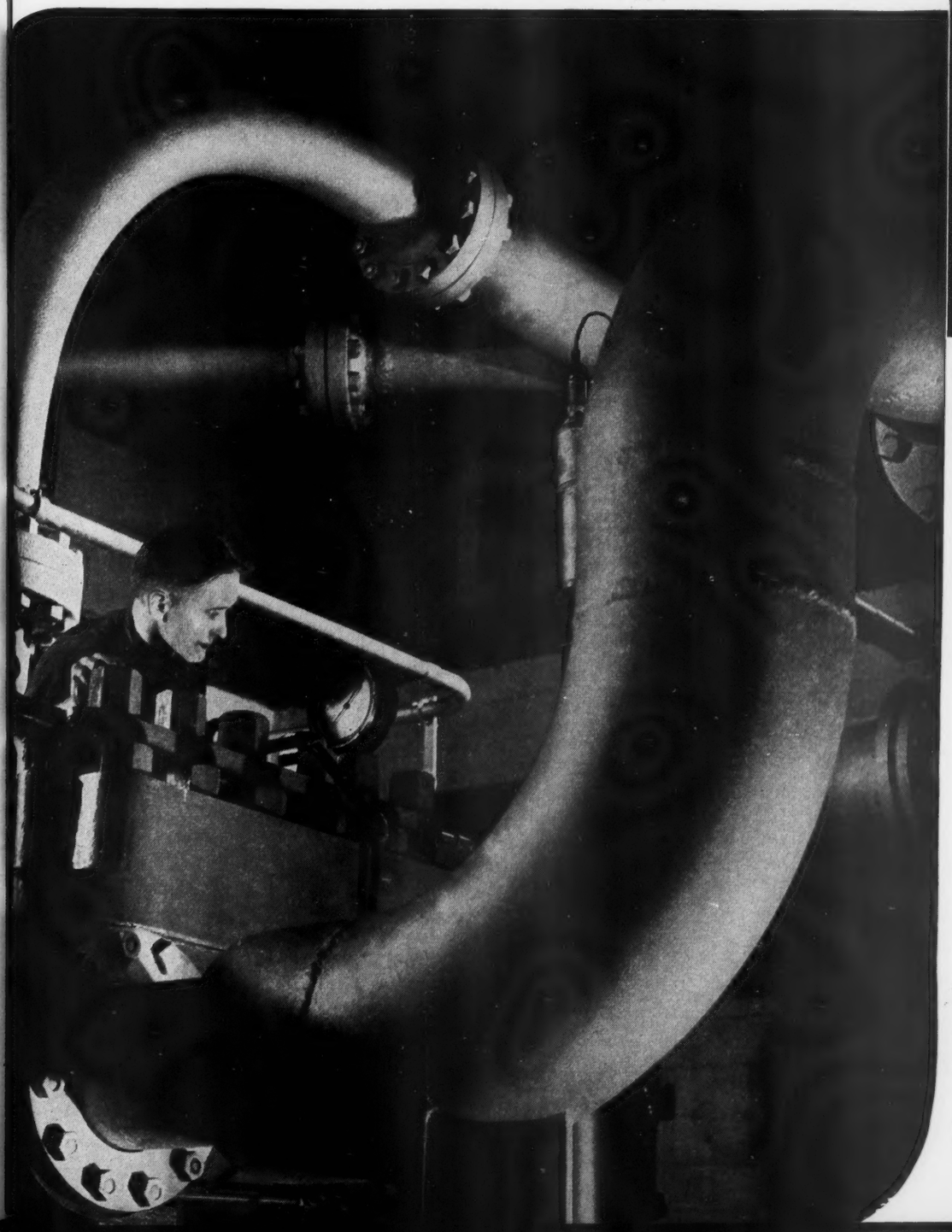
Tools—Catalog 66. Fifty-two pages. Portable electric saws, drills, hammers,

No maintenance worries when SAFE, dependable J&L SEAMLESS goes into your *Power Piping* job

Power plant engineers and maintenance men all over the country have long looked with favor on J & L Seamless Pipe, for they know its reputation for dependable service, safety and strength. Hundreds of successful installations in factories, power and processing plants prove the remarkable operating efficiency and the excellent workability of this high quality pipe.

Each length of J & L Seamless is manufactured from a solid billet of specially selected steel, uniformly heated to correct rolling temperature. The high quality of the steel and the J & L Seamless process assure the right amount of ductility for easy bending, coiling and upsetting—plus the strength and ruggedness that give long life and extra safety.

You can depend upon J & L Seamless to carry the load. There are no weaknesses to invite trouble or cause plant shut-downs. Specify J & L Seamless Pipe for all future power and process requirements — and for replacement jobs as well. You'll find that J & L Seamless stands up under the most severe treatment, gives years of trouble-free service and saves money in lower maintenance costs.



J & L—ALWAYS MAKING FINER CARBON STEEL PRODUCTS FOR NEW AND BETTER USES

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JONES & LAUGHLIN STEEL CORPORATION

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When One Toe Is Smashed

A SCREAM of agony. You pity him. He'll be laid up for two, three... maybe five weeks. But, what about your side of the picture?

You pay the hospital bill! You pay compensation during his layoff. And how about the lost time in training a new man to take the injured worker's place?

Cut your hospital and compensation costs by having *all* your workers wear Hy-Test Safety Shoes. Their steel "turret-top" toe protects even under terrific blows. Hy-Test shoes have other rugged safety features, too. Yet many styles are just as good-looking and comfortable as ordinary shoes... and cost no more!

Call these facts to the attention of the man responsible for safety in your plant. He'll want to write for booklet, *Industry Speaks*, describing how *you save* when Hy-Test Safety Shoes save the feet of workers.

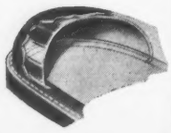
HY-TEST HEROES

The sturdy steel toe cap in this Hy-Test shoe saved amputation when a 1400 pound casting dropped on its wearer's toe.

A 4500 pound truck rolled over the steel "turret-top" toe of this Hy-Test shoe, but there was no injury. No lost time.

Here's the Reason Why

Hy-Test's "turret-top" toe of steel, roomy for comfort, sturdy for safety, anchored securely by the flange.



HY-TEST INTERNATIONAL SHOE CO. SAFETY SHOES

HY-TEST SAFETY SHOES

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shears, and other electric tools. Specifications and prices.—Stanley Electric Tool Div., New Britain, Conn.

Tools—Catalog G9. Power tools for the woodworking and metalworking industries.—Walker-Turner Co., Inc., Plainfield, N. J.

Tools—1939 Catalog. Entire line of 114 portable electric tools—drills, saws, heat gun, valve seat grinders, valve refacers, etc.—The Van Dorn Electric Tool Co., Towson, Md.

Tools—Catalog. "Handee" tool of "1001 uses." Brushes, speed controls, steel cutters, etc.—Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago.

Transformers — Descriptive Data 46-200. Self-protecting, surge protected, and conventional types of small distribution transformers. — Westinghouse Electric & Mfg. Co., East Pittsburgh.

Trucks — Bulletins. A-8416: Type EP-10 low-lift platform truck. A-8459: Type ELN-10 high-lift platform truck. Both have rated capacities of 10,000 lb. —The Elwell-Parker Electric Co., Cleveland.

Turbines—Booklet B 2175. Type M, general-purpose turbine; 100-2,000 range.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Unit Heaters—Bulletin H 139. Large-capacity Kramer heaters for duct systems or high-velocity free discharge. Conversion table, capacities, and dimensions.—Trenton Auto Radiator Works, Trenton, N. J.

Valves—Bulletin 514. Air-operated "Synchro-Valves" for automatic control. Principles of design, types, features, and operating characteristics.—The Bristol Co., Waterbury, Conn.

Valves — Bulletin 520. "Paracoil" 3-way swing valves. Construction, sizes, dimensions, drawings of flange arrangements.—Davis Engineering Corp., Elizabeth, N. J.

Valves—Bulletin 214-1. Air-operated control valves. Quick-opening type for open and shut control. "Stabilflo" type for throttling control.—The Foxboro Co., Foxboro, Mass.

Ventilators—Bulletin S340. Types, operation, and installation of unit ventilators.—The Trane Co., La Crosse, Wis.

Welding, Punching — Bulletin 3902. Portable hydraulic welding equipment, punching and stripping units.—Progressive Welder Co., 737 Piquette Ave., Detroit.

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BOOKS

THE DETERMINATION AND ADMINISTRATION OF INDUSTRIAL RELATIONS POLICIES

Helen Baker, Assistant Director, Industrial Relations Section. Industrial Relations Section, Princeton University, Princeton, N. J. 74 pages, selected bibliography. $1.50.

Report to show how and by whom industrial relations policies are determined and administered is based on a selected group of one hundred companies of varying size and type of industry, and on some public utilities whose personnel organization and problems are comparable. Covers the formulation of policies, development of their company-wide understanding, personnel department organization, employment, training and wage administration, group relations and grievance procedures, and company plans for employee security.

PUBLIC RELATIONS FOR BUSINESS

Milton Wright. Whittlesey House, McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 346 pages, index. $3.

Mr. Wright talks companies and cases to show what business has been doing about public relations, and describes

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In an age of specialization, the jack-of-all-trades just doesn't belong.

And in the particular branch of power transmission engineering devoted to *variable speed control* that fact becomes constantly more apparent.

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Onliwon helps keep healthy men on the job!

This small investment in sanitary washrooms pays big dividends in good health, good work, and good will.

You'll actually *save* by giving your employees the extra protection of Onliwon Towels and Tissue. Dispensed from locked, sanitary cabinets.

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THE WORKER, THE FOREMAN AND THE WAGNER ACT

Russell L. Greenman, Consultant in Labor Relations, McKinsey, Wellington & Company. Harper & Brothers, 42 East 33d St., New York. 137 pages, index. $1.50.

Written for the foreman, supervisor, or department head, this book sets forth important rulings of the National Labor Relations Board that touch upon the foreman's job, his rights and ob-ligations, under the Wagner Act. The "do's and don'ts" for foremen, the tac-tics to be pursued in dealing with em-ployees, especially on such questions as discharge, selection of employee repre-sentatives and organizations, discrimin-ation, and so forth, are dealt with.

PATENT TACTICS AND LAW

Roger Sherman Hoar, Commercial Attorney, Bucyrus-Erie Co. The Ron-ald Press Co., 15 East 26th St., New York. 315 pages, index, table of cases. $4.50.

Revised edition of *Patents*, by the same author. Presentation of patent tactics and an analysis and interpreta-tion of a great part of the patent law for those executives and engineers who deal with patent attorneys. Contains suggestions on effective legal procedure for securing patents; also, outline of a policy for protection against loss of patents and against maneuvering by competitors.

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS

John L. Alden. The Industrial Press, 148 Lafayette St., New York. 220 pages, diagrams, graphs. $3.

Covering exhaust ventilation, low-pressure pneumatic conveying, the de-sign of hoods, piping and structural details, and the selection of dust sepa-rators and centrifugal exhaust fans, this book tells the engineer how to design, build, or buy an exhaust system.

FAN ENGINEERING

Edited by Richard D. Madison. Buf-falo Forge Co., Buffalo, N. Y. 739 pages, tables and charts, index. $4.

Fourth edition. Embracing air en-gineering in general, this book presents condensed information in handbook style. Part I deals with physics of air; Part II, air conditioning and other fan applications; Part III, fans and air conditioning apparatus. A new sec-tion on power equipment, fan details, and so forth has been included. Tables have been revised on the basis of new data.

FRACTIONAL HORSEPOWER ELEC-TRIC MOTORS

Cyril G. Veinott, Design Engineer, Westinghouse Electric & Mfg. Co. McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 431 pages, charts, index. $3.50.

Written for those engaged in the design, manufacture, use, and repair of fractional-horsepower electric motors, this book presents descriptions, data, and diagrams for 18 major types, and discusses what makes them run, what they will do, how to repair, rewind and reconnect them.

THE NEW MANAGEMENT

H. T. Hildage, T. G. Marple, F. L. Meyenberg, formerly Professor of In-dustrial Administration, and Manager of the "Refa" (German Institute of Work and Time Studies). Distributed by Chemical Publishing Co., Inc., 148 Lafayette St., New York. 358 pages, index. $6.50.

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A G-E "Regulator" to Give You Better Lighting— Better Motor Performance

The new line of G-E air-cooled regulators includes regulators for automatic and for hand operation in single-phase ratings from 1.2 kva to 12 kva. For the regulation of lighting and power circuits, 10 per cent raise and 10 per cent lower are provided. The line also includes regulators with 100 per cent raise and 100 per cent lower—for testing purposes and for the control of voltage in industrial processes, such as those using resistance or induction furnaces

YOU know that voltage delivered at the correct level at your service entrance may fluctuate widely on your plant circuits because of varying power loads and lighting loads. You also know the advantages—in higher efficiency and increased production—of maintaining correct voltage on these circuits.

Now you can do it—economically—with the new G-E air-cooled induction regulators. They operate on the same principle as the larger units used by power companies. They give a smooth, precise voltage regulation that means better lighting, better motor performance, and better service from other electric equipment.

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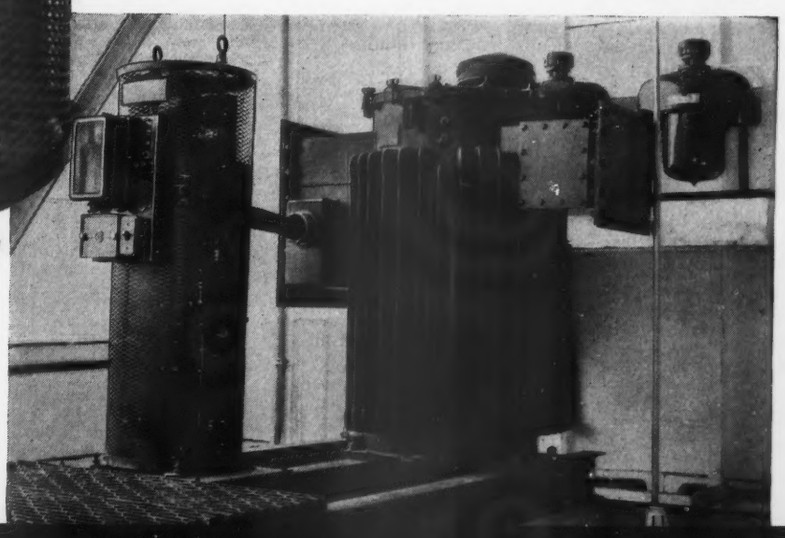
Find out for yourself how little these regulators cost. Ask your G-E representative for details, or write for Bulletin GEA-3057. Address General Electric, Dept. 6-201, Schenectady, N. Y.



This automatic air-cooled regulator, installed next to a Pyranol transformer on an overhead platform, regulates a lighting circuit in a modern factory

GENERAL ELECTRIC

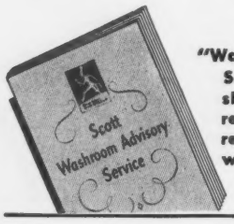
350-144

There's GOLD in your washrooms

MORE TIME is wasted in washrooms than in any other part of the plant or office. Inefficient arrangement, poor fixtures, a limited supply of towels—any or all of these things cause delay and loitering and eat up overhead.

Instead, why not put your washrooms on a paying basis? How? By making them work constructively as part of your industrial relations program. Plenty of hot water, soap, sanitary ScotTissue Towels turn washrooms into daily builders of valuable employee good will.

Most important of all—your washrooms can be made modern, up-to-date without one cent of additional cost. Why not send for this free booklet of efficiency and cost-reducing facts already used to put thousands of washrooms on a satisfactory and economical basis?



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"Washroom Advisory Service" Booklet shows you how to relieve congestion... reduce overhead in washrooms.

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Emphasizing principles but keeping close to actual practice, the authors describe management methods, aids, and expedients that their experiences in American, British, and German industry have shown to be adaptable in today's industrial management problems.

NORTH CAROLINA INDUSTRIAL DIRECTORY AND REFERENCE BOOK

Compiled under the direction of the Division of Commerce and Industry, State of North Carolina Department of Conservation and Development, J. T. Anderson, Industrial Engineer. North Carolina Department of Conservation and Development, Raleigh, N. C. 932 pages. $7.50.

State-wide and county-wide lists of manufacturers classified according to types of industries; also, a list of industries and commercial houses by towns and cities, and statistical data and summaries for counties and the State.

MANUAL FOR EXECUTIVES AND FOREMEN

Erwin Haskell Schell, Professor of Business Management, and Frank Forster Gilmore, Assistant in Production, Massachusetts Institute of Technology. McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 185 pages, index. $2.

This manual for executives presents tested methods of reducing costs, increasing quality, and insuring service. From nearly a thousand methods of manufacturing analysis studied over a period of seven years, the authors selected procedures combining simplicity, practicality and effectiveness in revealing opportunities for improving operations and employee attitudes.

ROBERT GAIR: A STUDY

H. Allen Smith. The Dial Press, Inc., 432 Fourth Ave., New York. 118 pages. $2.

This study of Robert Gair, practical man, industrial pioneer, founder of Robert Gair Company, Inc., inventor of the method of cutting and creasing which made possible the mass production of folding cartons, is one of historical interest. To understand him, the industry he helped to create, is, said Lewis Mumford, "to have a keener insight into the material sources of modern civilization."

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ON THE CALENDAR

MARCH

7–10, American Management Association, Ninth Packaging Conference and Exposition, New York. Alvin E. Dodd, President, 330 West 42d St., New York.

MAY

2–4, Chamber of Commerce of the United States, Annual Meeting, Washington, D. C. Ralph Bradford, Acting, Secretary, 1615 H St., N. W., Washington, D. C.

8–12, National Fire Protection Association, Annual Meeting, Chicago. Franklin H. Wentworth, Managing Director, 60 Batterymarch St., Boston.

22–25, National Association of Purchasing Agents, Annual Meeting, San Francisco. G. A. Renard, Secretary, 11 Park Place, New York.

JUNE

13–16, Smoke Prevention Association, Thirty-third Annual Convention, Milwaukee. Frank A. Chambers, Secretary-Treasurer, 139 North Clark St., Chicago.

26–29, National Association of Cost Accountants, Annual Meeting, Atlantic City. S. C. McLeod, Secretary, 385 Madison Ave., New York.

26–30, American Society for Testing Materials, Annual Meeting, Atlantic City. C. L. Warwick, Secretary-Treasurer, 260 South Broad St., Philadelphia.

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The new COMET ELECTRIC HOIST can bring reduced costs into your plant. At a new low price level and very low operating cost, you can now have the economy—speed—convenience of COMET ELECTRIC HOISTS.

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Analyze your lifting jobs—intermittent or continuous—and use COMETS to save money for your company. A small investment will pay big dividends in increased profits. Write for literature.

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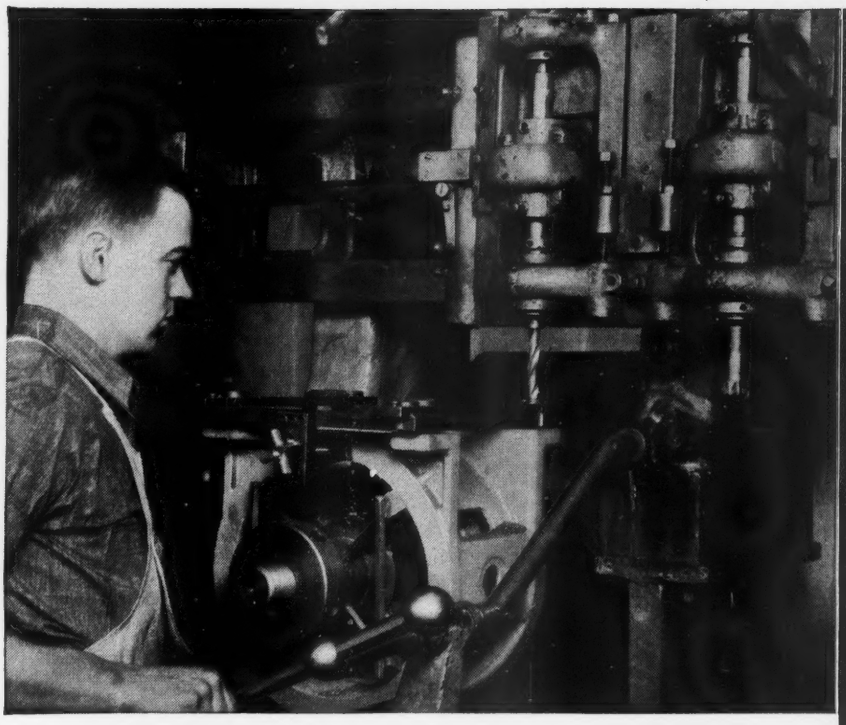
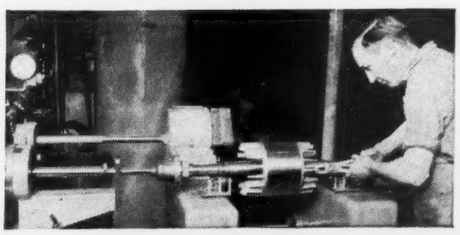


MILLED AND DRILLED to give you better alignment

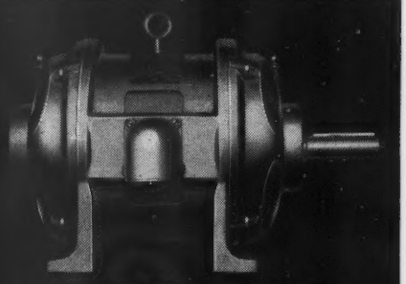
There is one characteristic of every step in the making of a Delco motor: As many operations as possible are done with one set-up, to insure absolute accuracy; and each machined surface is registered with every other machined surface.

Most operations are done on special machines, designed and built for the particular job, so that absolute uniformity of manufacture is maintained. For example, the rough main frame of a Delco motor is chucked through the stator opening; all four feet are milled to the same height, and in the same place; and the mounting holes are drilled—all in one set-up. This precision is typical of every operation at Delco Products. That is why we ask you to look *within* the motor you specify.

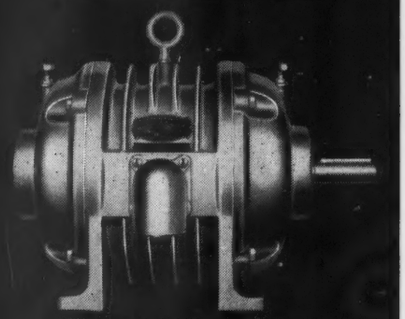


EVERY DELCO MOTOR IS DYNAMICALLY BALANCED

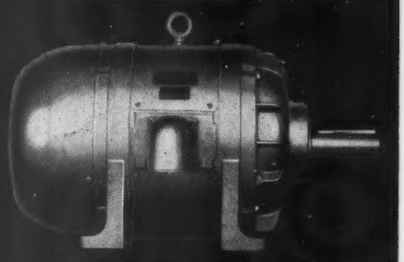
No motor leaves Delco Products that has not been dynamically balanced on a specially-designed balancing machine. Delco balances every motor. Each end of the rotor and shaft is first balanced independently, while the machine indicates exactly how much compensation is required and where it should be applied. After all adjustments have been made, the complete rotating assembly is given a final check. Delco motors assure satisfactory balance.



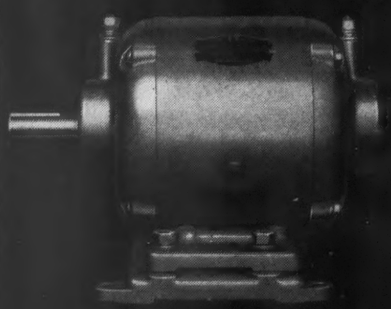
Open Frame, Sleeve or Ball Bearing



Totally Enclosed Ball Bearing



Totally Enclosed Fan-Cooled Ball Bearing



Fractional Horsepower Motor

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Delco industrial AC motors are available in various types, possessing electrical and mechanical characteristics to meet practically every requirement.

Normal starting torque—normal starting current—high starting torque—low starting current—as well as high slip. Each type available in open frame, sleeve or ball bearing—totally enclosed ball bearing—totally enclosed fan-cooled ball bearing—also multi-speed motors. Electrical and mechanical modifications available. Delco motors comply with NEMA standards.

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SEND FOR A SAMPLE OF BLAW-KNOX *Electroforged* STEEL GRATING

Check these 5 points of superiority
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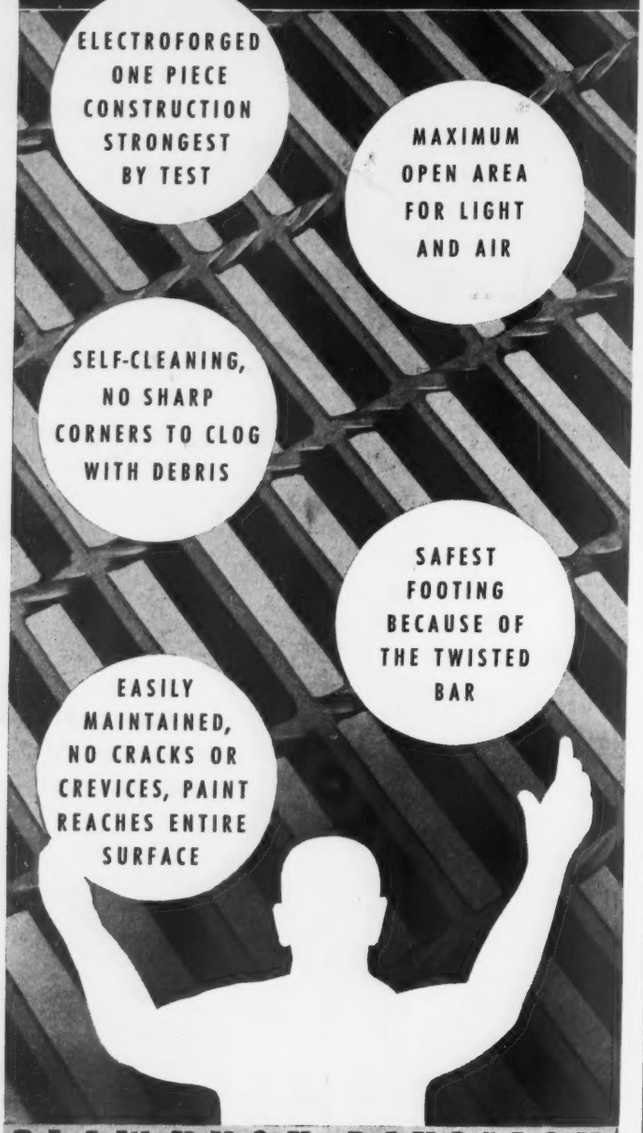
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SAFEST FOOTING BECAUSE OF THE TWISTED BAR
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Typical factory installation of Emerson-Electric Power-Duty Exhaust Fans.

EMERSON ELECTRIC *POWER-DUTY* EXHAUST FANS

Exhaust Up to 16,800 cu. ft. Per Minute!
Seven sizes—12-inch to 48-inch

Toxic gases, dust, smokes, odors, excessive heat need no longer be a problem in your plant. No matter what the condition or area to be served, Emerson-Electric Exhaust Fans can, separately or in battery, keep the air changed regularly with the least possible expense.

Emerson-Electric Power-Duty Exhaust Fans are available in five sizes, 12- to 30-inches, direct-drive, in two-speed, ball-bearing, and single-speed, sleeve-bearing; also, in 36-inch, 42-inch and 48-inch, single-speed, belt-driven models. Automatic shutters for all sizes. Write for Bulletin "How to Select Emerson-Electric Exhaust Fans" No. 244.

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A powerful, 3-speed fan, capable of delivering a large volume of cooling, penetrating breezes. Can be mounted on wall, bolted in upright position, or mounted on Adjustable Floor Stand. Heavy wire-mesh guard makes the fan safe for all industrial use. Capacitor Motor reduces operating cost 24%. Carries the 5-Year Factory-to-User Guarantee. Write today for the Emerson-Electric Air Circulator Bulletin No. 245. The Emerson Electric Mfg. Co. St. Louis — New York — Chicago.

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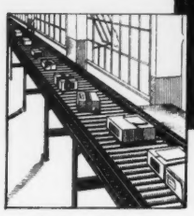
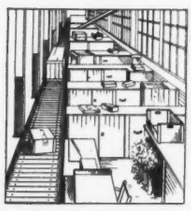
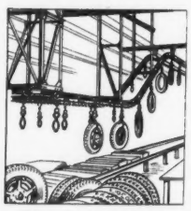


Roller Gravity

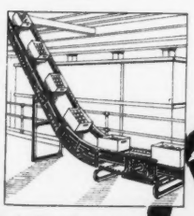
Belt Conveyor



Slat Conveyors



Overhead Chain



Push-Bar Booster

Because A LAMSON *engineer put his finger on a* "HIDDEN PROFIT ZONE"

Your plant may have a spot where goods and materials loaf on the job—where unnecessary halts rob you of dollars and profits, or delay production to the point where men must work overtime to ship orders. Discover these costly slow spots. You can call in an expert who can focus attention on a new source of profit for you. Dozens of profit-minded Lamson engineers *right now* are tackling just such plant problems and coming out with the right answer. Hundreds of plants have quickened the movement of materials, increased their profits and licked competition by following the suggestion of a Lamson Engineer.

Just look at this down-to-earth, dollars and cents savings for Yardley in their Jersey Plant. At the Yardley plant a profit-minded executive took a tip from a Lamson Engineer. He was quick to install the simple, efficient conveyors shown in the picture above and today he watches out-going shipments flow through his packing department with less confusion and with a speed that eliminates costly overtime. The Yardley plant now handles cartons at a profit-building rate. Materials move out faster—in better condition and produced at a price that means extra profits for the plant. The balance sheet shows real money saved because of fewer handlings—no costly overtime and quicker shipping service. Here is a simple, efficient installation saving the money every day that will soon pay for it.

Let a Lamson Engineer make his suggestions about your plant—let him help you hunt out the spot where lagging materials can be made to move faster—let a LAMSON ENGINEER help you locate the *Hidden Profit Zone* in your plant. Send today for your copy of this valuable free book. It pictures actual installations and shows how hundreds of plant managers have made extra profits for their plants. Send today.

LAMSON conveyors

SEND FOR FREE BOOK

THE LAMSON COMPANY, Inc.
Syracuse, N. Y.

Send me without obligation a

- ☐ FREE copy of your new Conveyor booklet.
- ☐ Have your nearest Sales Engineer call.

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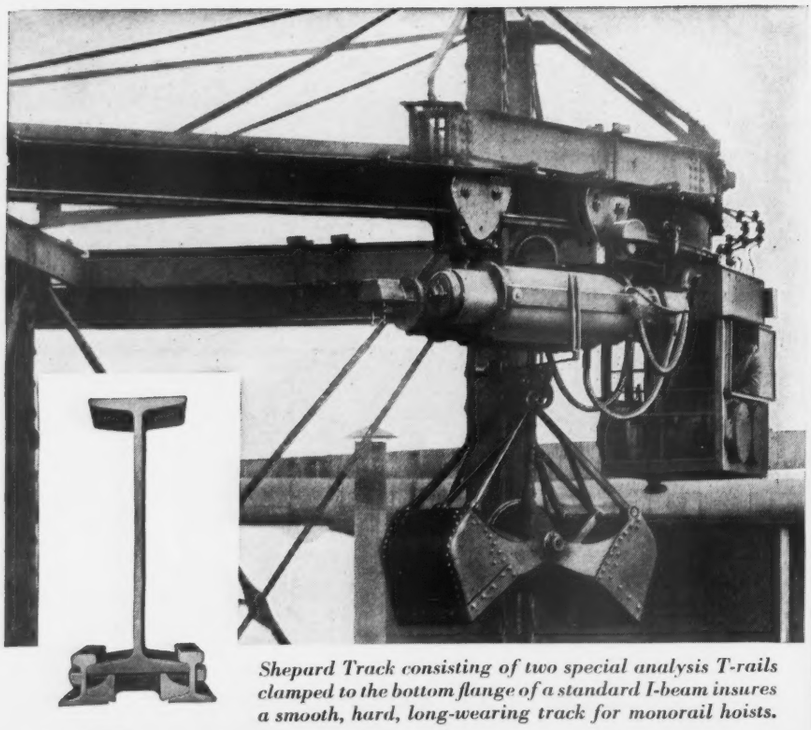


Shepard Track consisting of two special analysis T-rails clamped to the bottom flange of a standard I-beam insures a smooth, hard, long-wearing track for monorail hoists.

AERIAL RAILWAY OF INDUSTRY

● One Shepard Niles electric monorail hoist gives "express service", indoors or out to any point in the plant or yard carrying loads of every description. Furnished with single or double hooks in capacities from ⅛ to 10 tons.

They are also ideally suited to the accurate control of any standard electro-magnet or grab bucket.

Write for catalogs illustrating and describing the "Aerial Railway of Industry".

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

364 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.

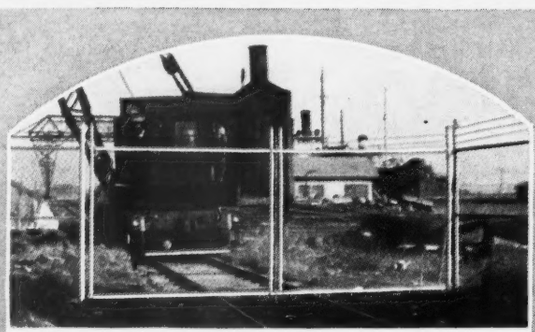
A Breath, or a **BLAST**

THIS SCHRADER BLOW GUN provides a selective air flow over the full pressure range of the shop's air supply . . . just a breath for light work, or a blast for clearing away heavy chips. It's rugged too, built to stand the roughest kind of use. Surprisingly few parts . . . little or no maintenance required. Specify "Schrader" on your next order for Blow Guns. Available through all Mill Supply houses.

Write for Free booklet "AIR-TIGHT", which gives 10 easy tests that will help eliminate waste in handling air.

Schrader
REG. U.S. PAT. OFF.

A. SCHRADER'S SON Dept. FMM **BROOKLYN, N. Y.**
Division of Scovill Manufacturing Company, Incorporated



ANCHOR FENCES Stay in Line

Anchor Fences give *permanent* protection against trespassers, trouble-makers; help organize plant traffic. They always stand straight and true because their deep-driven "anchors" spread out under ground and keep the posts permanently in line.

For nearly half a century, industrial organizations have relied on Anchor Fences and the skill of Anchor's Nation Wide Erecting Service for the solution of countless industrial fencing problems. Write today for Anchor Manual and address of nearest Branch Office.

(Above) Anchor Chain Link Fence protecting industrial property. Anchor's complete line of fences and gates also includes Iron Picket Fences for all industrial purposes.

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Write today for Anchor Industrial Fence Manual containing ideas, specifications, that will help you solve your fence problems.

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CHAIN LINK
IRON PICKET
for Every Purpose

Work's eye View

TELLS THE STORY OF FASTER, SMOOTHER FILING

ESTABLISHED 1840 REG. U.S. PAT. OFF.

Teeth staggered like a harrow! The Disston Bite-Rite File cuts, smoothes and levels at each stroke. Disston Engineering developed this file which successfully combines speed of cut, long life and smoothness of filed surface.

Disston Bite-Rite has sturdy, sharp tooth design . . . correct contour of cutting tip, proper support at back, rugged shoulders between teeth.

Non-clogging gullet is round, smooth, open . . . assures free, clear, clean discharge of chips. Chips from work done with a Bite-Rite File are heavy, long, curling, like chips from a lathe tool.

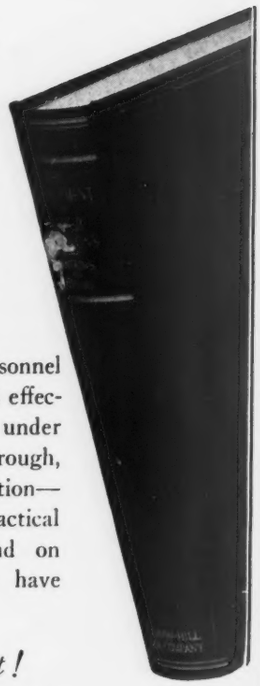
Disston Bite-Rite Files will speed your production, give you better work.

For sample files, write your Distributor of Disston Bite-Rite Files. Made by Henry Disston & Sons, Inc., Philadelphia, U. S. A.

BITE-RITE

NEW DISSTON FILE

How to secure better results in handling your employees



What are the methods of personnel management that have been found effective in industry and business under today's conditions? Here is a thorough, authoritative answer to that question—a painstaking report on the best practical thinking in this field today and on methods and procedures that have worked.

Just Out!

The Management *of* Labor Relations

By Gordon S. Watkins and Paul A. Dodd

Dep't of Economics, University of California at Los Angeles

780 pages, 6 x 9, $4.00

BOTH the results of special research and the practical experience of American industry, business and government have been drawn upon to give concreteness to the problems discussed and the methods of procedure adopted to deal with them.

Every personnel manager, every top executive, will find this important new manual a constant reference help in

—selecting employees
—planning wages and wage systems
—devising workable pension plans
—reducing labor turnover
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These views show MotoReduceRs driving food processing machines.

MOTOREDUCER gives you extra sales features because . . . . . .

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Note how the MotoReduceR forms an integral part of the two pieces of equipment shown above. No doubt it will fit in your requirements as well.

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Efficiencies up to 97% prove its economical operation. Such power savings are always of interest to equipment buyers.

It's DEPENDABLE
Trouble-free operation results from superior design, expert manufacture plus highest quality materials. You can trust MotoReduceR not to let you down.

It's MODERN
A streamlined exterior houses the most modern type bearings, accurately cut gearing, efficient method of lubrication.

Write for full information about the MotoReduceR. It's made in Horizontal and Vertical types.

PHILADELPHIA GEAR WORKS
Industrial Gears and Speed Reducers
ERIE AVENUE AND G STREET, PHILADELPHIA

SAFETY for Richfield at Watson Refinery

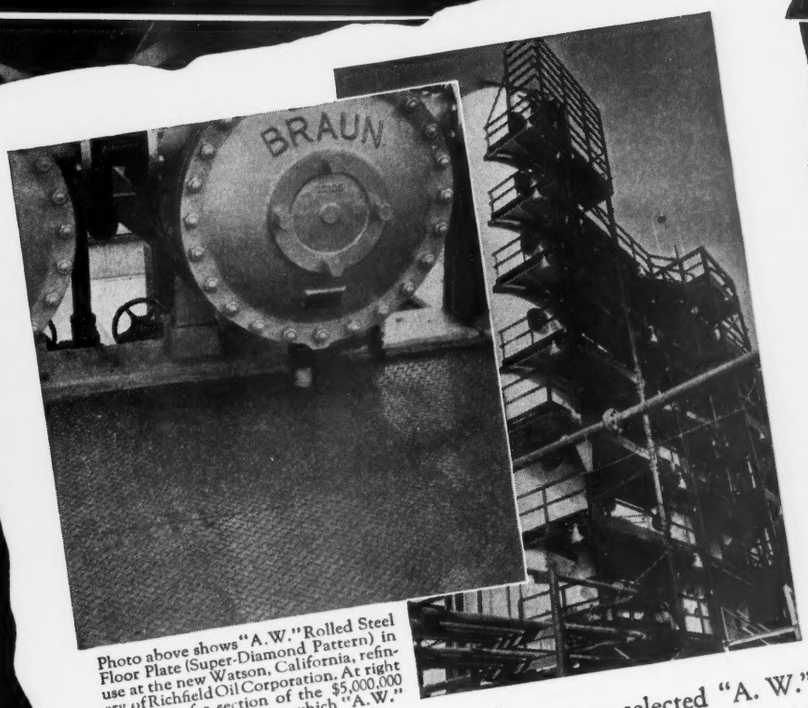


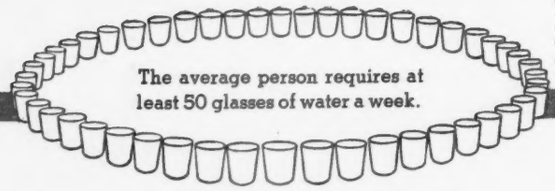
Photo above shows "A.W." Rolled Steel Floor Plate (Super-Diamond Pattern) in use at the new Watson, California, refinery of Richfield Oil Corporation. At right is a view of a section of the $5,000,000 plant showing towers on which "A.W." Floor Plate is in use.

The reasons why Richfield Oil Corporation selected "A. W." Rolled Steel Floor Plate (Super-Diamond Pattern) for use in the new $5,000,000 refinery at Watson, California, are the same reasons why you will want this safe, economical flooring in your plant. "A.W." Floor Plate is safe from every angle, under any condition. Furnishes equal traction in all directions. Costly slipping and falling accidents are reduced to a minimum. Oil-proof, heat-proof, crack-proof. Easy to clean, quick to drain. Toughest traffic will not damage or impair it. Literature showing five patterns and giving complete engineering data is ready for your asking.

"A.W." *Rolled Steel* FLOOR PLATE

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS, CONSHOHOCKEN, PENNA. : : SINCE 1826 : : DISTRICT OFFICES AND REPRESENTATIVES—Philadelphia, New York, Boston, Detroit, Los Angeles, Seattle, San Francisco, Houston, Roanoke, Buffalo, Pittsburgh, Cleveland, Chicago, Cincinnati, New Orleans, St. Paul, St. Louis, Montreal. PRODUCTS INCLUDE—"A. W." Rolled Steel Floor Plate : : "Swede" Pig Iron : : Billets—Blooms and Slabs : : Sheared Steel Plates : : Hot Rolled Sheets and Strip : : Steel Products also furnished in Copper and Alloy analyses.



FASTER COOLING

AT LOWER COST

WITH THESE ADVANCED FEATURES

A double barreled blast at water cooler operating costs. That's what Westinghouse engineers have delivered with two amazing new developments. First, a Special Capacity Booster that utilizes cold drain water to help cool incoming water. Second, a Cooling Chamber that steps up efficiency by over-all cooling action at both center and circumference.

Other Exclusive "PLUS VALUE" Features

Stainless Steel Top . . . Built-in Watchman Protection . . . Permanent Oil Supply . . . Burnout-Proof Motors . . . Hermetically-sealed Mechanism.

No grit, dirt, rust or corrosion . . . the things that cause most machinery to wear out, can harm the Westinghouse mechanism because it is Hermetically-sealed inside an airtight case of solid steel.

Because it is Hermetically-sealed, Westinghouse provides a plan for five years' protection on the sealed-in mechanism. This is based on the EXTRA years of trouble-free performance which experience shows you can confidently expect.

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Westinghouse

WATER COOLERS

Explosion-proof models available

FREE. Ask your Westinghouse dealer for free copy of a useful folder—"How to Check Drinking Water Costs" or mail this coupon to—Westinghouse Electric & Manufacturing Company, Section 9039, Mansfield, Ohio.

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PHILLIPS RECESSED HEAD SCREWS

"SIGN OF QUALITY"—SAY CONSUMERS

Considered Added Value on New Cars, Electrical Appliances, Furniture . . . Manufacturers Urge Salesmen to Point Out Screws

With leaders in all branches of the screw-using industries changing from slotted screws to Phillips Recessed Head Screws, the American public is given another means of identifying *manufacturing initiative*.

In selling and advertising these famous makes, the Phillips Screw — small as it is — is given special attention. The fact that it strengthens resistance against loosening, is free of jagged burrs, and improves appearance — is considered potent sales ammunition by manufacturers who recognize the public's shrewdness in demanding *quality* in even the smallest details.

2 OUT OF 3 NEW CARS SPORT PHILLIPS SCREWS

A survey of 1939 models shows a preference for Phillips screws. Two out of three manufacturers have decided that it costs less to use Phillips.

REPORTED 50% SAVING IN ASSEMBLY COST

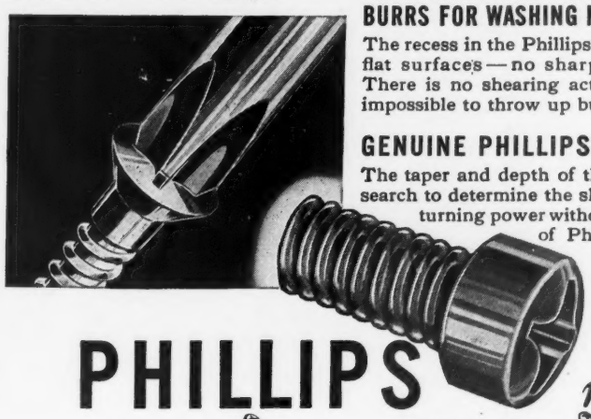
Amazing reductions in assembly cost result from time savings which occur when Phillips Recessed Head Screws replace slotted screws.

Power drivers are used more frequently, since the recess in the screw head protects against driver slippage. Operations can be omitted — like driving pilot holes, removing crooked screws, filing off burrs.

Assembly cost savings up to 50% and more are reported by manufacturers in many industries.

WOMEN HAIL SCREWS WITHOUT BURRS FOR WASHING MACHINES

The recess in the Phillips Screw has flat surfaces — no sharp corners. There is no shearing action — it is impossible to throw up burrs.



GENUINE PHILLIPS RECESS—THE HEAD CAN'T SPLIT

The taper and depth of the Phillips recess resulted from months of research to determine the shape which would utilize the driver's maximum turning power without sacrifice of strength in the screw head. 4 sizes of Phillips Drivers provide greatest efficiency for entire range of Phillips Screw sizes. 2 driver sizes fit diameters #5 to #16.

THIS VALUABLE BOOKLET

Shows how you can cut assembly costs immediately. Address one of the firms below for free copy.

PHILLIPS *recessed head screws*

MACHINE SCREWS · SHEET METAL SCREWS · WOOD SCREWS · STOVE BOLTS

U. S. Pat. on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338
Other Domestic and Foreign Patents Allowed and Pending

American Screw Co., Licensor, Providence, R. I.
Chandler Products Company, Euclid, Ohio
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corporation, New Britain, Conn.
The Lamson & Sessions Co., Cleveland, Ohio
National Screw & Mfg. Co., Cleveland, Ohio
Parker-Kalon Corporation, New York, N. Y.
Pheoll Manufacturing Company, Chicago, Illinois
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Scovill Manufacturing Co., Waterbury, Conn.

IT COSTS LESS TO USE PHILLIPS SCREWS

Setting the Table For the Northern Pacific

Recently the Northern Pacific Railway replaced an old 85 foot turntable at Pasco, Washington with a new one 135 feet in length. The difficult task of setting this great table, designed for a 592 ton locomotive, challenges the ingenuity of both men and machines.

Handling the world's largest tonnage of materials has taught our railroads how to do their job exceedingly well. Therefore, it is significant that, in their own materials handling, they use thousands of locomotive cranes of every size and type. Equally so is the fact that in their choice of cranes, Industrial Brownhoist has ranked first for over half a century.

Fast, dependable and built from the ground up for hard service, Industrial Brownhoists are earning profits year after year for their owners in every line of industry. May we furnish you complete data so you can determine what your own savings would be?

The 3 cranes shown were used to place the completely assembled new turntable, as well as to remove the old one; a temporary work track between the two cranes in the background being utilized to first take away the old table and then bring the new one over the pit.

INDUSTRIAL BROWNHOIST

GENERAL OFFICES: BAY CITY, MICHIGAN

DISTRICT OFFICES

New York, Philadelphia, Pittsburgh, Cleveland, Chicago,

What's that you said!

4 Models

The Burgess Acousti-booth blots up noise. Thus you talk and hear in quiet. Learn how this booth absorbs noise. Write for bulletin describing the 4 Acousti-booth models.

How to improve plant phone service!

● Noise interferes with phone service in factory, shipping room, and office. Worse still, noise causes serious misunderstandings of instructions. This is why so many plants have installed the Burgess Acousti-booth. The Acousti-booth blots up noise. This principle is so successful that it is endorsed by telephone engineers. Use Burgess booths for better phone service.

Send for the facts today!

Now send the coupon for the free Bulletin showing (for all Burgess Acousti-booth models)—photographs, descriptions, specifications and prices. Get this bulletin and learn how to improve plant phone service!

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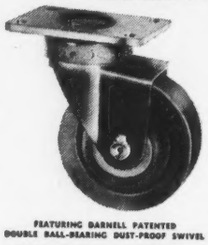
Manufacturing under Burgess Patents

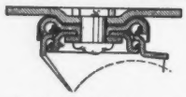
BURGESS

Increase SAVINGS

WITH DOUBLE BALL BEARING SWIVEL

DARNELL CASTERS & WHEELS





Cheap casters may perform with fair efficiency when new, but the slight saving effected on the basis of lower price is poor consolation when the heavy costs of later floor replacements and equipment repairs must be met.

Darnell Casters and Wheels are made to effect SAVINGS over many years of efficient, trouble-free service. Write today for your copy of the 192 page Darnell Caster and Wheel Manual. Here will be found the right type of caster and wheel for every type of floor or service.

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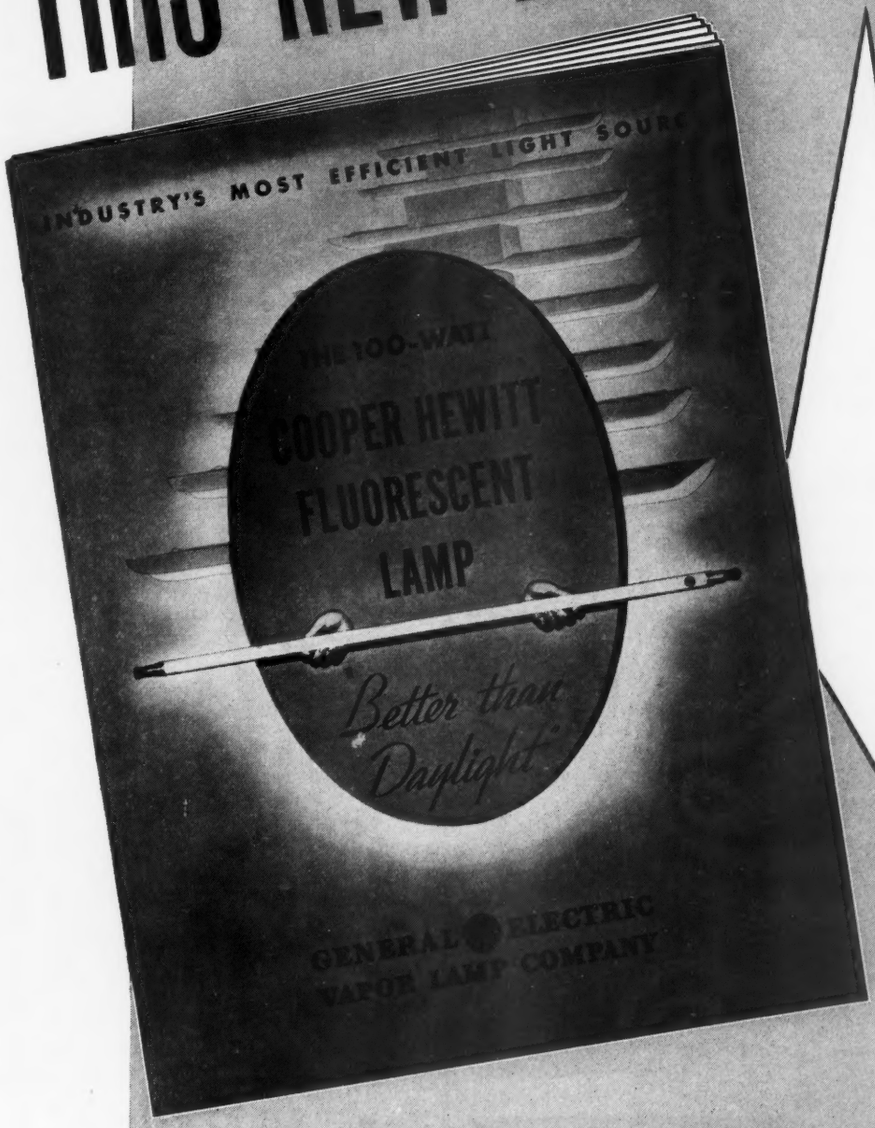
gives the story of industry's newest and most efficient light source



HIGH LIGHT OUTPUT
HIGH EFFICIENCY
LONG LIFE
COOL BLUE WHITE LIGHT
ELECTRICAL CHARACTERISTICS
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LOW INSTALLATION COST
NO DARK SHADOWS
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Higher, more productive illumination levels at less cost. Elimination of annoying shadows, glare and eye-fatigue. These are some of the many advantages of this new blue-white industrial light source. » » » Write for a copy of this book. It's freely offered.

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Gold Stripe Brushes—made of the finest Chinese Bristle. Famous for their ability to give smooth paint application and for all 'round economy. Each brush furnished with a special patented protective jacket.

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Brushes of bristle, wire or tampico for every industrial need. Floor Sweeps, Mill Dusters, Wire Scratch and Casting Brushes. Also Refillable Spiral Wound Brushes for large scale production of light gauge metals and tin plate.

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The No. 8 is ideal for melting up to 22 lbs. of any low-fusion metal or alloy. Pot instantly removable. The powerful adjustable torch is designed for perfect soldering, tempering and pre-heating work. Burner instantly removable for use as portable hand torch. Famous JOHNSON Patented Direct Jet Bunsen Burner achieves "Air-blast" efficiency and intensity without requiring blower. Send for free catalog now!

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PROTECTS METAL SURFACES AGAINST
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THE NITROSE COMPANY, INC.
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THEY ALL COME BACK FOR... *More Light*

● American industry is voting a straight ticket for Owens-Illinois Insulux Glass Block. An automobile manufacturer has specified it in six different plants; a large utility has used 40,000 Insulux blocks in seven power houses; four repeat orders for a railroad.

Western Printing and Lithographing found Insulux so helpful to better printing that it is now used as a wall material in three plants at Racine and Poughkeepsie.

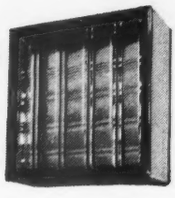
Both views, Western Printing and Lithographing Company, Racine, Wis., and Poughkeepsie, N. Y. Edwin J. Kraus, Architect, Milwaukee.

Insulux transmits anywhere from 41 to 86.5 percent of incident light, depending on the design selected, and provides excellent insulation. Look at the dividends: adequate lighting, easier temperature control, reduced condensation where humidities run high, an aid to air conditioning, pleasant working conditions, improved employee morale.

Not costly, Insulux combines wall and window in one material, eliminates painting, requires only occasional washing.

Keep ready for reference a copy of the Insulux industrial book or our 24-page catalog. Write Owens-Illinois Glass Company, Insulux Products Division, Toledo, O.

OWENS · ILLINOIS
INSULUX



FIRST IN GLASS
GLASS BLOCK

What's Wrong with this Picture?

You wouldn't use a brassie on the green. Why be less particular about the fans you use in your factories, especially when the *right* fan will not only do the work better, but at lower cost?

For over 60 years, we have been specializing in fan design and manufacture. During that time we have designed and built fans for every conceivable air handling job—large fans, small fans, slow-speed fans, high-speed fans, fans to handle acid fumes and dust, ventilating fans, forced draft fans, and many others.

We are always pleased to give our customers the benefit of this experience in helping them to solve their own air handling problems.

BUFFALO FORGE COMPANY

471 BROADWAY **BUFFALO, N. Y.**

Branch Engineering Offices in Principal Cities

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" BREEZO FANS for low cost ventilation. Easy to install wherever you need them. Motors are totally enclosed to keep out dust and dirt.

"Buffalo" E BLOWERS for blast to oil furnaces, forges, and other similar uses where a comparatively small volume of air is required at high pressure.

"Buffalo" STEEL PLATE EXHAUSTERS for exhausting and conveying all kinds of dust, shavings, chips, bark, lint and many other waste materials.

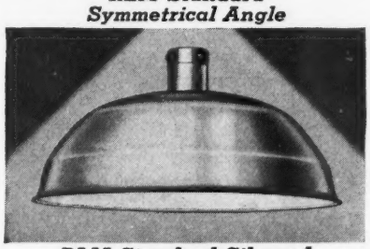
The RIGHT FAN for EVERY AIR HANDLING JOB

WHEN YOU THINK OF *Lighting* THINK OF WESTINGHOUSE

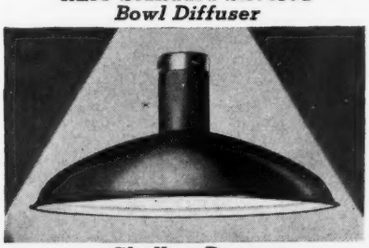
RLM Standard Dome

RLM Standard Deep Bowl

RLM Standard Symmetrical Angle



RLM Standard Silvered Bowl Diffuser



Shallow Dome

Glassteel Diffuser

Install the Locklite Line for *Complete* INTERCHANGEABILITY

"LOCKLITE" is an ingenious and exclusive electrical and mechanical connecting and disconnecting principle, which introduces an entirely new type of industrial reflector suspension and maintenance. This principle has been applied by Westinghouse to all of the industrial lighting reflectors shown in the panel at the left. Now complete interchangeability of reflector types and sizes is possible.

Simple to install. Easy to maintain. Safer. More efficient . . . and completely interchangeable! All of these advantages are yours in "the Locklite Line" of Industrial Lighting Reflectors.

At the time of installation, only the hood, from which the reflector is detachable, requires handling. The receptacle inside the hood does not have to be removed for wiring.

"Thirty second maintenance" is not only a fact but becomes a prime feature. Remove the dirty reflector with one hand and replace a clean reflector including lamp with the other. No switching off and on of the current and only one trip up the ladder.

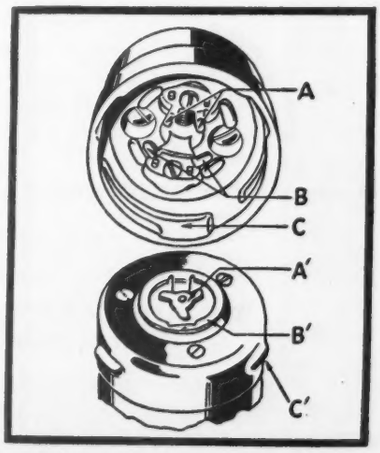
Safer, because every Locklite unit "lights when it's locked." More efficient, obviously!

COMPLETE INTERCHANGEABILITY however, is the decisive factor in many an industrial installation. One hood fits all reflectors, both of the medium and mogul type, making all Locklite Units interchangeable. Convenient, practical and economical, Locklite solves the out-of-stock problem once and for all.

Don't take our word for it. Ask to see Locklite at your own desk. Your nearest Westinghouse Distributor will be glad to oblige. Or write for descriptive folder with full details to Westinghouse Electric & Manufacturing Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

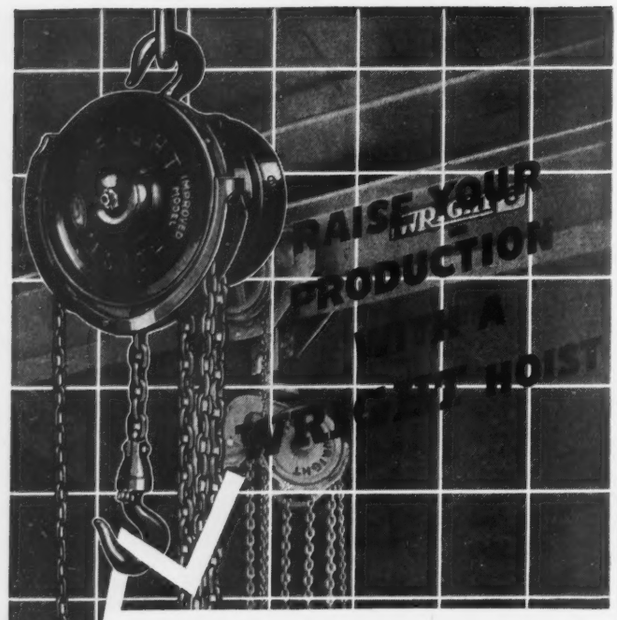
Westinghouse is a member of

RLM STANDARDS INSTITUTE



Locklite Reflector "neck and hood"... showing electrical contacts A and A', B and B' and positioning slots C and C'.

Westinghouse Lighting Equipment



● Production costs go down when the Wright Improved High Speed Hoist takes over your material handling jobs. This hoist is fast and powerful. It is operated with ease and convenience. It is a rugged piece of equipment that serves faithfully through a long and useful life.

The Wright Improved High Speed Hoist has 21 definite points of superiority. Every part is zinc coated to prevent corrosion. Smooth, positive action is insured by precision load wheel bearings. A safety guard prevents the load chain from riding out of the pocket, regardless of position. Among the other 18 features are points of construction and selection of material that give you important operating advantages. Write for complete descriptive material.

BUY ACCO QUALITY *in Wright Hoists, Tru-Lay Preformed Wire Rope, Reading-Pratt & Cady Valves, Campbell Abrasive Cutting Machines, American Chains, Page Welding Electrodes and Page Chain Link Fence.*

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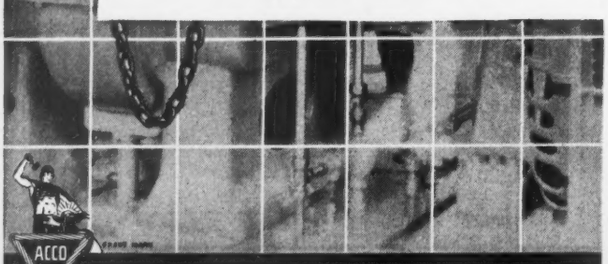
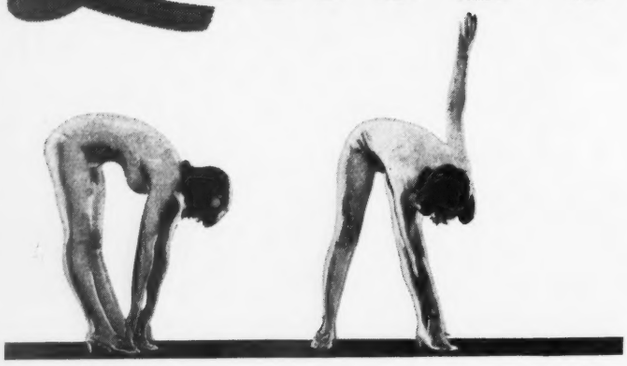


ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
In Business for Your Safety

Limber

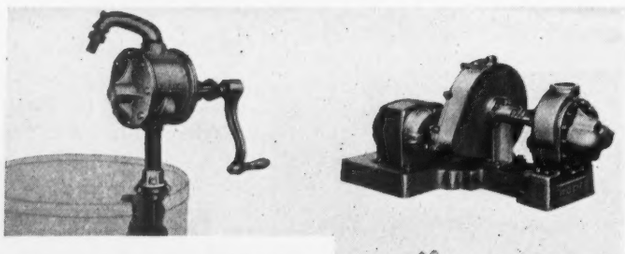


● Doing a bang-up pumping job is just exercise for a "Roper" . . . because all Roper Pumps have the limber, unrestrained performance ability that only long experience and sound engineering can produce.

We started building pumps in 1857 . . . 82 years ago . . . that's our experience record. Sound engineering is a Roper tradition that has been handed down from one generation to another . . . we will not be second to anybody in engineering.

You'll find Roper Pumps, of all types, more efficient and less costly to operate . . . furthermore, you'll find them easier to install. Detailed information and proof of Roper superiority will be sent promptly upon request.

Write FOR BULLETIN F-278
GEO. D. ROPER CORP., ROCKFORD, ILL., U.S.A.



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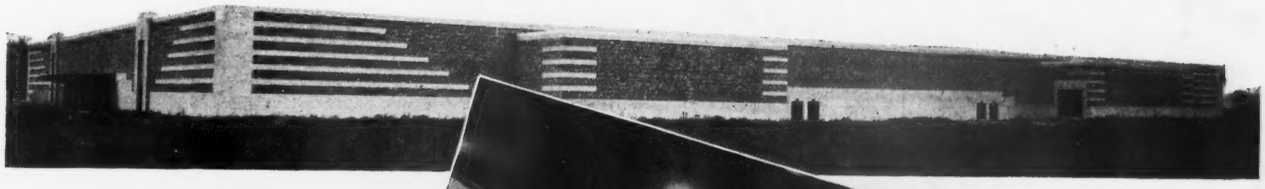
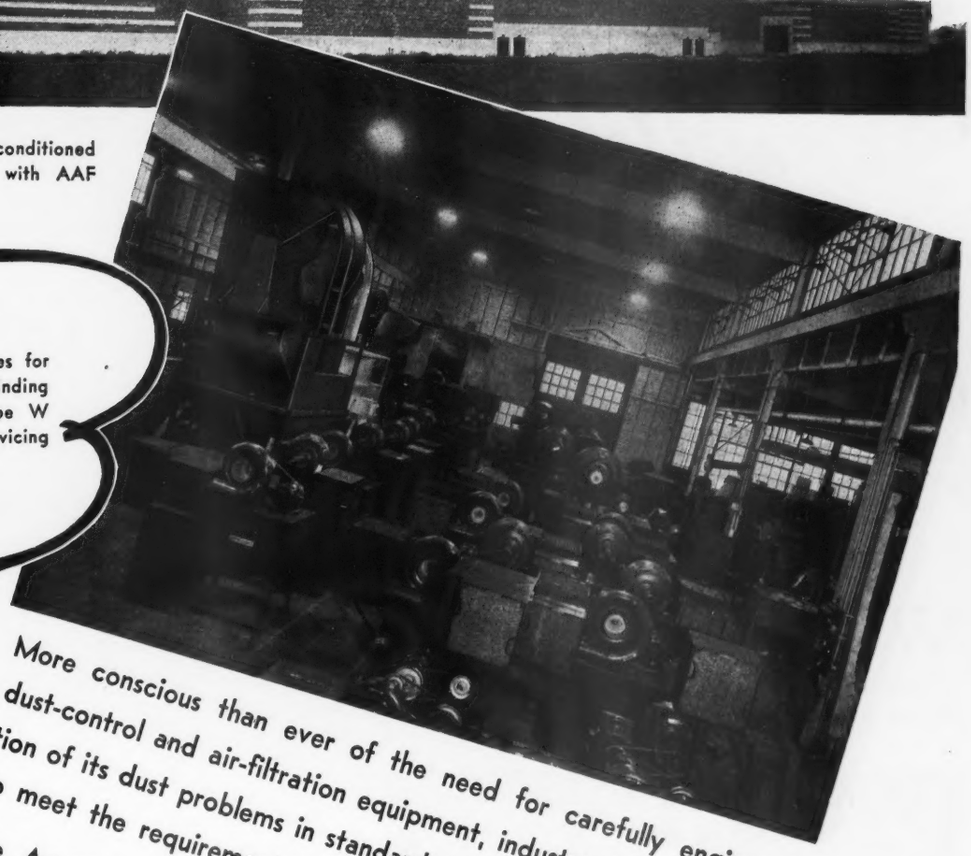
TRADE REG. U.S. PAT. OFF. MARK REG. IN CANADA
Rotary **PUMPS**

DEPENDABLE SINCE 1857

Simonds...the World's Most Modern Saw Plant...Specifies AAF Dust Control



American's first completely AIR conditioned windowless factory — equipped with AAF dust control.



28 Type D Roto-Clones for dust control on grinding equipment and 2 Type W Roto-Clones for servicing sand blast cabinets.

More conscious than ever of the need for carefully engineered dust-control and air-filtration equipment, industry is finding a solution of its dust problems in standard AAF equipment—*engineered* to meet the requirements of specific industrial applications.

The American Air Filter Company's Engineering Department is available to you—without obligation—to study your Dust Control problem and submit recommendations.

Address Dept. 301.

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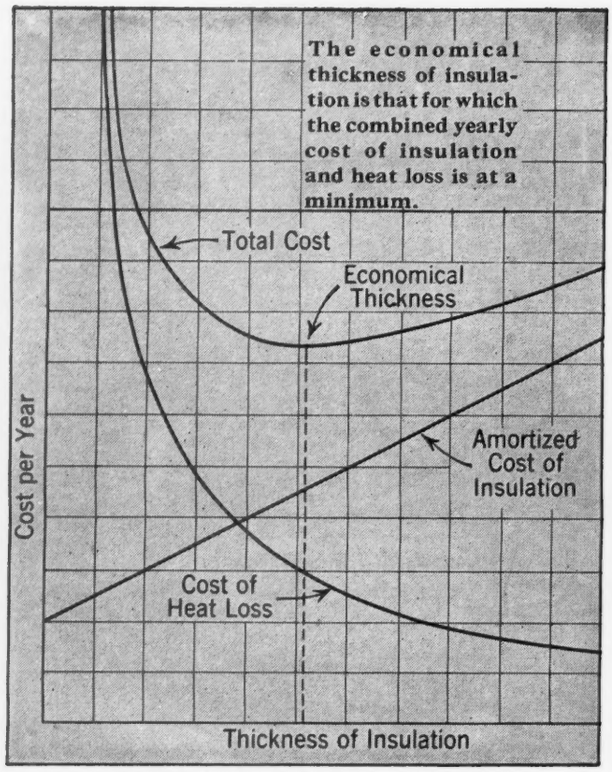
AIR FILTRATION AAF DUST CONTROL

How to SAVE THE MOST MONEY with INSULATION


The economical thickness of insulation is that for which the combined yearly cost of insulation and heat loss is at a minimum.
Total Cost
Economical Thickness
Amortized Cost of Insulation
Cost of Heat Loss
Cost per Year
Thickness of Insulation

Make sure all your equipment is insulated with the *correct materials* in the *one correct thickness* that combines maximum operation efficiency with minimum heat waste

WHETHER or not your insulation is a paying investment depends entirely on the materials used and the amount applied. *Too much* will never pay an adequate return . . . *too little* results in heat losses that build up excessive fuel bills. But proper insulation, properly applied, will avoid both these costly mistakes. And a J-M Engineer will be glad to work out the most economical application.

Let him go through your plant and make a thorough study of your requirements. He'll give you the benefits of all the knowledge and data that Johns-Manville has accumulated during 81 years of research and practical experience on insulation problems. He can show you—from the complete line of J-M Insulations in brick, block and pipe-covering form—what materials are best suited for all your equipment. He can tell exactly how much insulation you can profitably use, and his recommendations will point the way to worth-while reductions in your fuel costs.

J-M Insulation Engineers have saved many individual plants thousands of dollars a year. There's a good chance they can do the same for you. For full details on J-M's free Engineering Service and on J-M Insulating Materials, simply write Johns-Manville, 22 East 40th Street, New York City.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville INDUSTRIAL INSULATIONS

For every temperature . . .
For every service condition

Reduce Your Fuel Costs in 1939

Must this Belt handle WHEAT or ROCKS?

TRAINING KNOWLEDGE EXPERIENCE Puts the right Republic Conveyor Belt on the job

■ Differences in class and size of materials handled and variety of operating conditions make the proper application of Conveyor Belting a critical task. It takes highly skilled men to design and highly skilled men to produce the correct belt to install . . . the belt which will do the particular type of work most economically . . . . . .

Republic's field organization and factory experts coordinate their technical skill to provide the most serviceable belt for any application. Cover, fabric and rubber compound are selected for capacities to meet service demands. In establishing the number of plies and the correct weight of duck, the width, length, tonnage and horse power load are the principal factors which must be considered. Tests are made for tensile strength, adhesion and friction. The entire coordination of values insures the successful operation of Republic Conveyor Belting and Elevator Belting . . . . . .

This scientifically planned procedure is characteristic in the manufacture of all Republic Mechanical Rubber Products. Whether your requirements call for standard or special applications—you will receive additional satisfaction with your order for a Republic brand. Republic Rubber Division of Lee Rubber and Tire Corporation, Youngstown, Ohio.

ORDER REPUBLIC PRODUCTS FROM YOUR DISTRIBUTOR

REPUBLIC RUBBER

HOSE · BELTING · PACKING · MOLDED PRODUCTS

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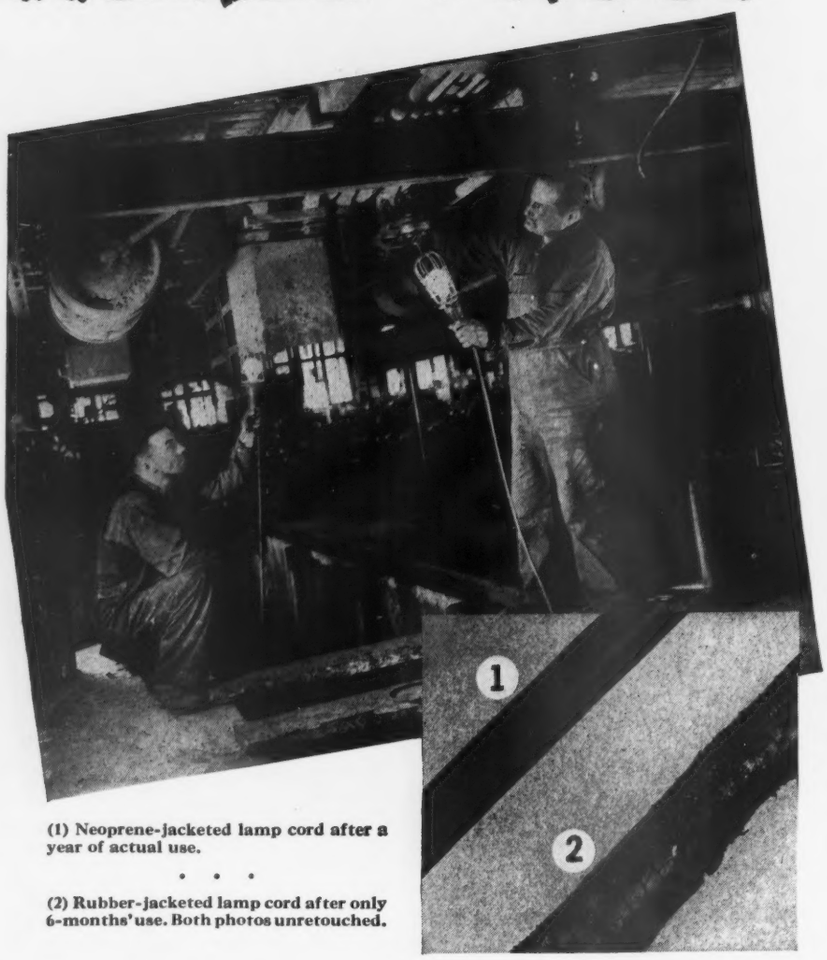

(1) Neoprene-jacketed lamp cord after a year of actual use.

• • •

(2) Rubber-jacketed lamp cord after only 6-months' use. Both photos unretouched.

See how shop test proves economy of neoprene lamp cable

IF YOU'RE in the market for better portable cable at lower maintenance cost (and who isn't?), you can profit by this experience of a city street railway company . . .

The superintendent of this street railway, intent on cutting upkeep costs, decided among other things that lamp cord in the shops needed replacing too often. Oil and grease were rotting the cotton covering.

Experimenting with other covering materials, he found that high-grade rubber jacketing was an improvement over the cotton. But when this rubber jacketing was, in turn, tested against jacketing of Du Pont *neoprene* . . . neoprene won in a walk. Because while neoprene, Du Pont's remarkable chloroprene rubber, has the strength, elasticity and toughness of natural rubber . . . it is far less affected by oils, gasoline, sunlight, ozone and air.

Neoprene covered cord is now standard in this street railway shop. Repair and replacement costs have gone down. And the superintendent's stock, you may be sure, has gone up.

Take the hint. Specify neoprene covering next time you buy portable cable. Look for neoprene parts in other equipment you buy. That's your assurance of top quality, long service, and lowest maintenance cost.

DU PONT NEOPRENE

E. I. DU PONT DE NEMOURS & CO., INC.

RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

DIRECT MAIL LISTS

AS business paper publishers for over 50 years, McGraw-Hill is uniquely equipped to offer complete, authoritative direct mail coverage of Industry's major markets. Extreme accuracy is maintained (guaranteed to 98%) and through careful analysis of markets, complete classification of companies and personnel, etc., the widest possible selections are available. Send for handy reference folder "Hundreds of Thousands of Reasons Why" which describes how McGraw-Hill Lists are built and maintained.

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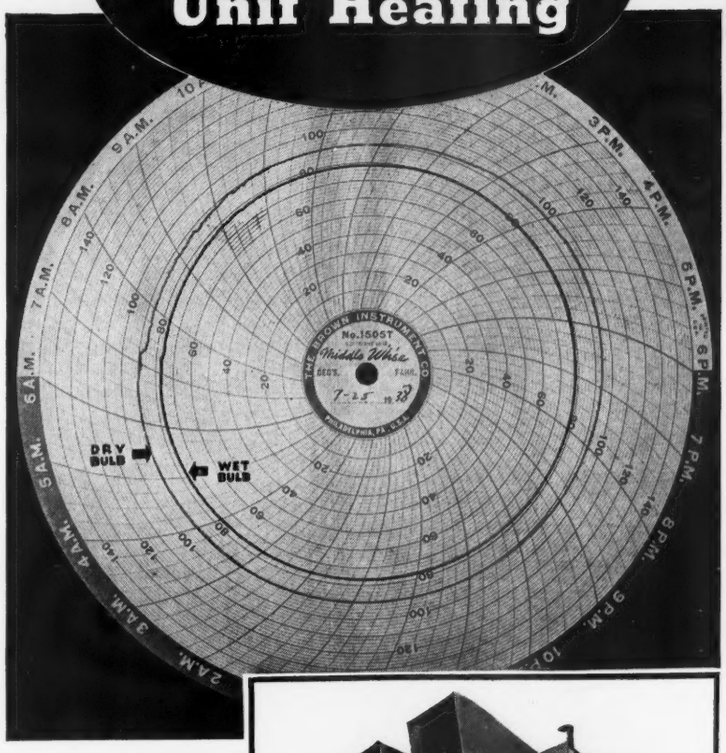
MAIL DIVISION McGRAW-HILL PUBLISHING CO

. . . Complete Lists Covering Industry's Major Markets

STOPS CONDENSATION *in Tin Storage*

Automatic Temperature Control Eliminates Condensation in Warehouse of Southern Tin Plate Mill

Carrier Unit Heating



1. GUARDS AGAINST DEW-POINT. A too close approach to dew-point means danger in storing tin plate because dew-point temperature of the tin plate means condensation. 32 Carrier Heat Diffusers, similar to this, prevent the tin plate temperature in this Southern Tin Plate Warehouse from reaching the dew-point by controlling the heat supply to maintain a margin of safety between the tin plate dry bulb temperature and the air wet bulb temperature, 24 hours a day, 365 days a year. Carrier Heat Diffusers supply quick heat when needed to 66,750 sq. ft. of floor space, minimize stratification, prevent dead air pockets and provide healthful Winter heat for workers.

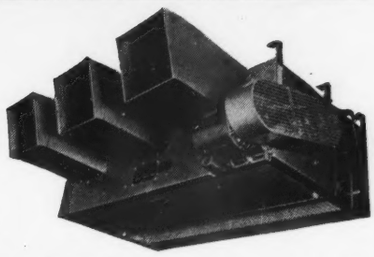
Cuts Your Heating Bill!

• Carrier Unit Heating equipment gives you 20 to 30% less fuel cost, 30 to 40% lower investment, 75 to 80% quicker heat. The new 1939 line of Carrier Unit Heaters come in varying sizes and designs.

Exclusive Carrier features make the entire line unique in efficient, low cost heating. Carrier Heat Diffusers have non-ferrous coils; the famous Carrier return bend which eliminates strain from expansion and contraction, makes leaking impossible; thermadjust controls to maintain constant temperature. Carrier Unit Heaters have these same advantages plus their availability for smaller spaces, adjustable louvres, and distinctive styles and finishes. Then there is the Carrier Gas-Fired Unit Heater which eliminates need for steam or hot water supply. It connects directly to your gas line, provides 1,300 to 3,900 cubic feet of warm air per minute—depending on size selected.

Ask your local Carrier dealer how Carrier Unit Heaters can cut your heating bill and assure maximum working comfort and best manufacturing conditions. If you prefer, mail coupon below for latest descriptive booklets. No obligation!

2. SAFETY FIRST. Margin of safety in preventing dew-point temperatures in tin storage is difference between dry bulb temperature of stored tin sheets and wet bulb temperature of air. This actual record of temperature control by Carrier Heat Diffusers shows how almost perfect margin of safety is maintained every hour, every day.



3. FLEXIBILITY. To provide spot heating for machine operators in other sections of the plant, and where floor space was not available, several suspended type Carrier Heat Diffusers were used. This suspended type Carrier Heat Diffuser requires little space, maintains comfortable working conditions. 40 Carrier Heat Diffusers in this mill give quick, low cost heat in the morning, comfort all day.

CARRIER CORPORATION, Syracuse, N. Y., Desk C8
In Canada—Box 1050, Station C, Toronto

Without obligation, send me latest technical booklets on ☐ Carrier Heat Diffusers; ☐ Carrier Unit Heaters; ☐ Carrier Gas-Fired Unit Heaters.

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Company.....

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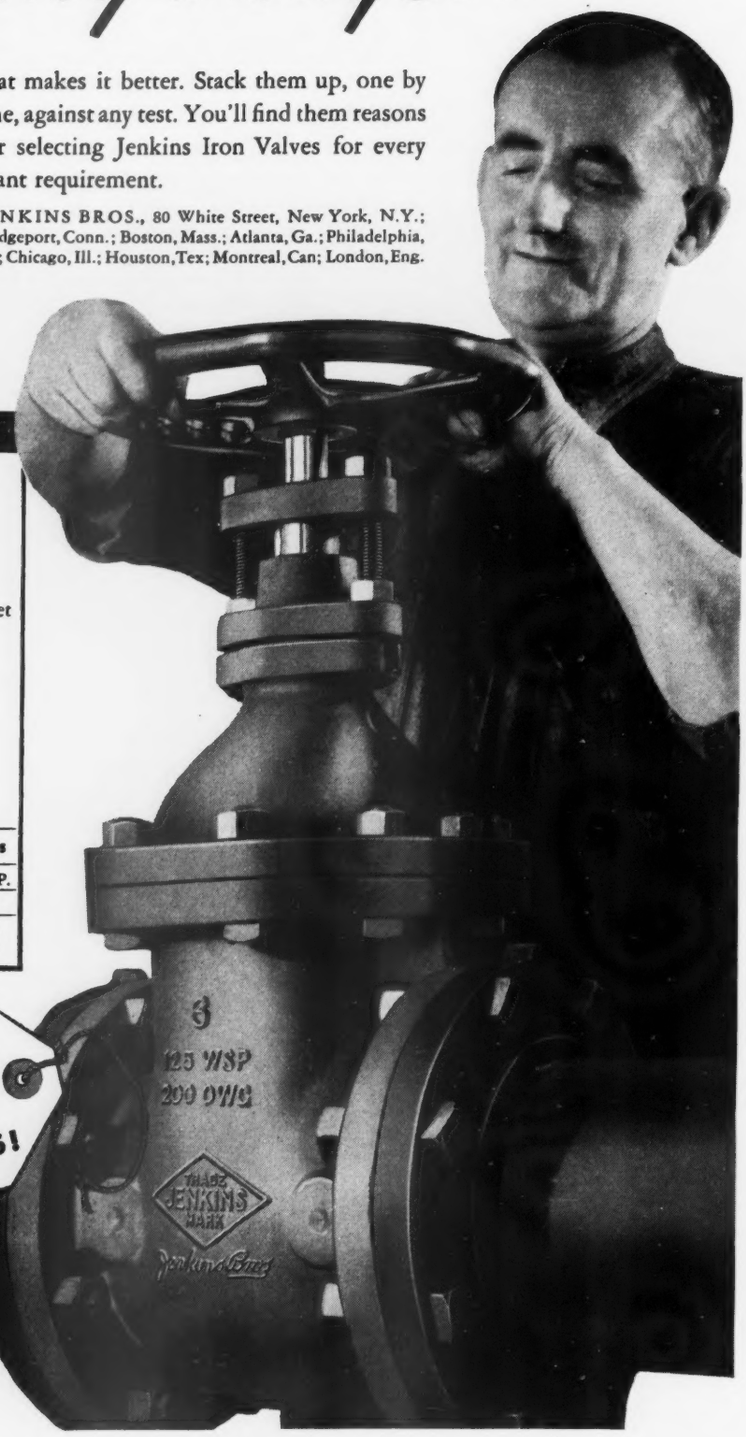
Top-Quality JENKINS iron VALVES *fit any budget!*

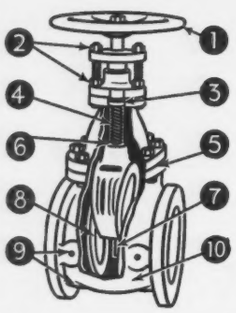
VALVE BUYERS are turning to Jenkins Iron Valves for plus features that mean top performance. They know that replacement and maintenance can snowball into many times the original cost. They buy to save, yet they pay no more. For Jenkins Iron Valves meet competition at on-the-line standard prices.

Look at the pictured Jenkins Iron Body Gate Valve. Put your finger on the featured parts that makes it better. Stack them up, one by one, against any test. You'll find them reasons for selecting Jenkins Iron Valves for every plant requirement.

JENKINS BROS., 80 White Street, New York, N.Y.; Bridgeport, Conn.; Boston, Mass.; Atlanta, Ga.; Philadelphia, Pa.; Chicago, Ill.; Houston, Tex; Montreal, Can; London, Eng.



PLUS FEATURES OF THIS I. S. GATE



1 Handy-Grip Wheel
2 Time-Saving Bolts
3 Liberal Thrust Collar
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Guide to Figure Numbers of Jenkins Inside Screw Iron Body Gate Valves

TYPE	125 Lbs. W.S.P.		175 Lbs. W.S.P.		250 Lbs. W.S.P.	
	Scw.	Flg.	Scw.	Flg.	Scw.	Flg.
Solid Wedge . .	325	326	251	255	203A	203
Double Disc . .	872	873	—	—	876	877

A TYPICAL JENKINS IRON VALUE —THERE ARE 101 OTHERS!

1864 TRADE JENKINS MARK 1939
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DON'T LET THE DEMON RUST EAT INTO YOUR PROFITS!

Stop Costly Corrosion With Pittsburgh Metal Protective Paints!

RUST is a pernicious, destructive demon, its appetite insatiable. Conservative estimates place industry's loss due to rust at more than one billion dollars yearly. Whenever iron, water and oxygen meet, this costly corrosion begins.

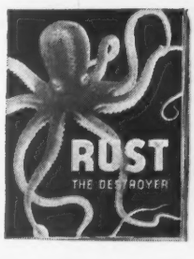
Don't pay a part of this billion dollar rust bill! Guard your metal structures with Pittsburgh's scientifically compounded metal protective coatings, designed specifically to prevent and check corrosion. These quick-drying, long-lasting finishes shut out the moisture, oxygen and the damaging fumes usually found in concentrated manufacturing centers. They provide a preservative coating against the natural enemies of construction surfaces. Pittsburgh Plate Glass Company, Paint Division, Pittsburgh, Pennsylvania.

Copr. 1939 Pittsburgh Plate Glass Co.

PITTSBURGH PAINTS

Smooth as Glass

COMPLETE LINE OF STRUCTURAL MAINTENANCE FINISHES



Find out for yourself all the vital facts about rust—what causes it and how to check its insidious advance. Send for "Rust The Destroyer". Just fill out the coupon below.

Pittsburgh Plate Glass Co.,
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Please send me free, your book, "Rust The Destroyer".

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3 is better than 10!

THESE 3 EAGLE BEARING METALS

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Eagle Bearing Metals are made to Controlled Specifications . . .

EAGLE DREADNAUGHT
For extreme speed and pressure conditions.

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Protect Your Equipment . . . Insist on Eagle's *Controlled Specifications*

● A single bearing metal failure causes plenty of grief—costs plenty of money. Avoid costly shutdowns by specifying Eagle Bearing Metals. They are made only of clean, primary metals that are scientifically alloyed under strict pyrometric control. Uniformity and long life are assured. Eagle Bearing Metals contain no hard spots to cut and score the shaft. Their use helps guarantee trouble-free operation.

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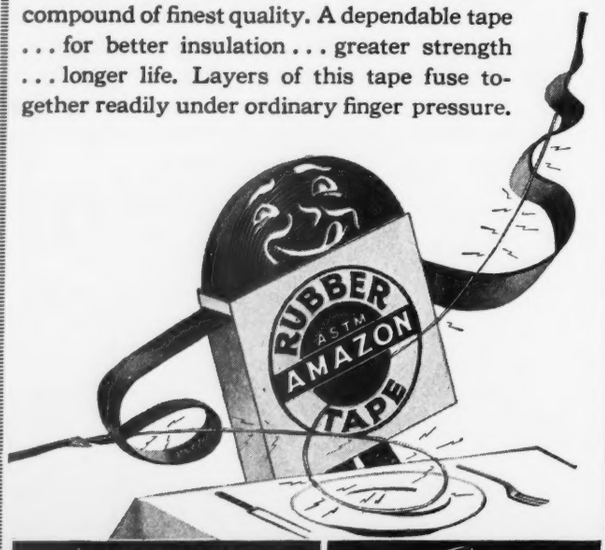
"HOT JUICE" IS MY MEAT!"

This tape is made of partially unvulcanized compound of finest quality. A dependable tape . . . for better insulation . . . greater strength . . . longer life. Layers of this tape fuse together readily under ordinary finger pressure.



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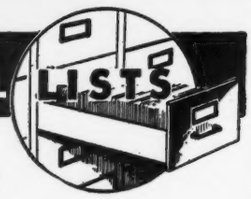

As publishers of Radio Retailing for twelve years, McGraw-Hill is uniquely equipped to offer complete, authoritative Direct Mail coverage of the Radio Trade. Extreme accuracy (guaranteed 98%) is maintained on a daily corrected basis and the widest possible selections are available. Send for folder entitled "Hundreds of Thousands of Reasons Why" which describes how McGraw-Hill lists are built and maintained.

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330 W. 42nd STREET NEW YORK, N. Y.

Doc. Steelstrap's BULLETIN

Issued by ACME STEEL COMPANY, Chicago, Illinois

ACME STEELSTRAP PROVIDES NEW "WAYS TO PROFITS" FOR 20,000 USERS

USE THESE TIME- AND MONEY-SAVING PRACTICES

Whether you ship your products in wooden containers, cartons, bundles, on skids or in special wrappings, chances are 10 to 1 you can make worth-while savings by using Acme Steelstrap. Shipments made by over 20,000 Steelstrap users include practically every type of product.

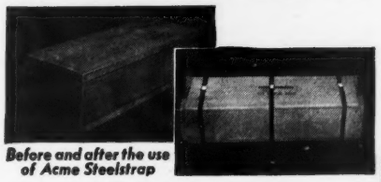
Acme Steelstrap makes "Bound to get there" packs—material, labor, time and costs are reduced—pilferage is eliminated and damage claims are lowered. Savings from 10% to 40% are not uncommon.

Saved $10,000 thus far in 1938

The use of Acme Steelstrap enables a cleanser manufacturer to eliminate the old pack for dealer cartons. Thus far in 1938, *ten thousand dollars* have been saved in material and labor alone.

Six cartons are *now* stacked (on cut-to-size 7/8" pieces of lumber) in two rows of three cartons each and strapped with 3/4" wide Steelstrap. These strapped bundles are easier to handle, save the cost of the outer container and effect an additional saving in freight on tare weight.

You, too, may be able to reduce your shipping costs by 25%

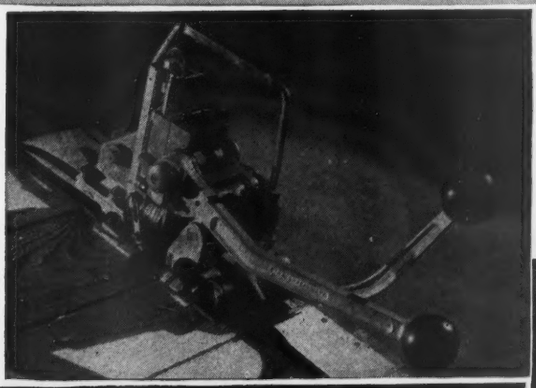


Before and after the use of Acme Steelstrap

You may be able to make even *greater* savings than the shipper of the box shown above. The weight reduction was 31%—and 40% less lumber was used. The total saving amounted to more than 25% for a container that was stronger and safer.

SAVES LABOR

By changing to an Acme Steelstrapper, which combines tensioning, sealing and cutting operations—and mounting this tool to a conveyor, a shipper of plastic firebrick saved the labor of one out of four packers. Three men now pack, steelstrap and ship more cartons (100 pounds each) per day with less fatigue than four men did formerly with old-type hand strapping tools.



NEW ACME NO. 2 STEELSTRAPPER NOW AVAILABLE

New Features Make Further Shipping Economies Possible

Now ready: the latest addition to the only line of strapping equipment which *combines* the tensioning, sealing and cutting operations with an automatic seal feed! Made to eliminate lost motion and provide additional economies, Acme Steelstrappers are built for speedy, steel-strap application. Designed for easy operation, one lever tensions while a single stroke of the other cuts the strap from the coil and makes a positive "Bound to Get There" sealed joint.

Automatic Seal Feed is an Exclusive Acme Feature

The automatic seal feed saves the time of applying seals by hand. Seals in clips of fifty or one hundred are placed in the magazine and as many Steelstraps applied without reloading.

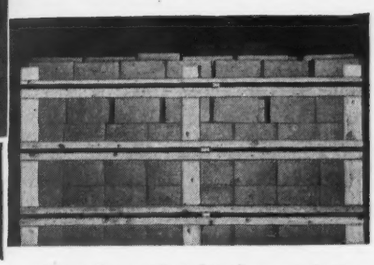
SAVES TIME AND CRATING COSTS

The Acme *Skid Idea* incorporates the use of non-returnable wood skids on which products of many types are quickly and effectively secured with Acme Steelstrap. Handling, storing, loading and unloading cars, etc., are easier and faster.

In addition to lowering costs, the Acme Steelstrap method reduces hazards to workmen and eliminates damage to products in transit.

POOL AND STOPOVER CAR SHIPPERS MAKE BIG SAVINGS WITH ACME'S UNIT-LOAD SYSTEM

The Acme Unit-Load System makes possible the elimination of unnecessary and costly bracing materials. Savings



are made on freight charges. Labor costs are lowered. Strong steel bands protect each section of the car from damage in transit and prevent mixups at the buyer's sidings. Loading time is lessened and material costs are reduced. Shipments for several customers are securely strapped in individual units, in this *approved* method of bracing, thereby avoiding the possibility of delay and loss. Unloading is easier and safer. The consignee merely snips the straps on his portion of the car. There are no nails to pull, no bracing to replace or mishandle.

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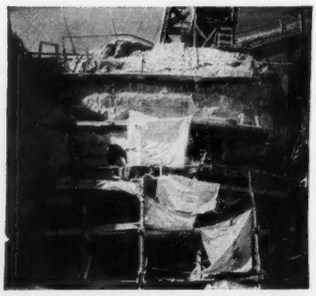
MEN MOLD MOUNTAINS

Sculptor Borglum's heroic figures look out across the Black Hills from 6000-ft. elevation

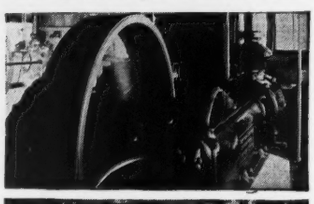
CLOSE-UP of the Mt. Rushmore Memorial Group at present. Note the enormous amount of granite that has been drilled and chipped so far. Note the workmen in various areas of the photo.

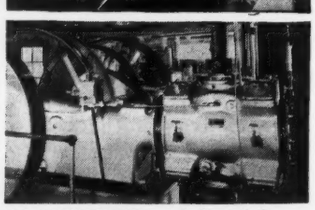
GUTZON BORGLUM'S famous Mt. Rushmore National Memorial, nearing completion in the Black Hills of So. Dakota, from a distance of 1500 feet. Washington, Jefferson, Lincoln, and Theodore Roosevelt will comprise the group.



OUT OF THIS MASS of granite, 6000 feet above sea-level, will emerge the likeness of Theodore Roosevelt. Thousands of cu. yds. of solid granite will have to be drilled and removed.

A CLOSE-UP of the partially finished likeness of Lincoln. Note ladders and cat-walks for comparative size. These figures are the largest ever to be hewn out of granite anywhere in the world.





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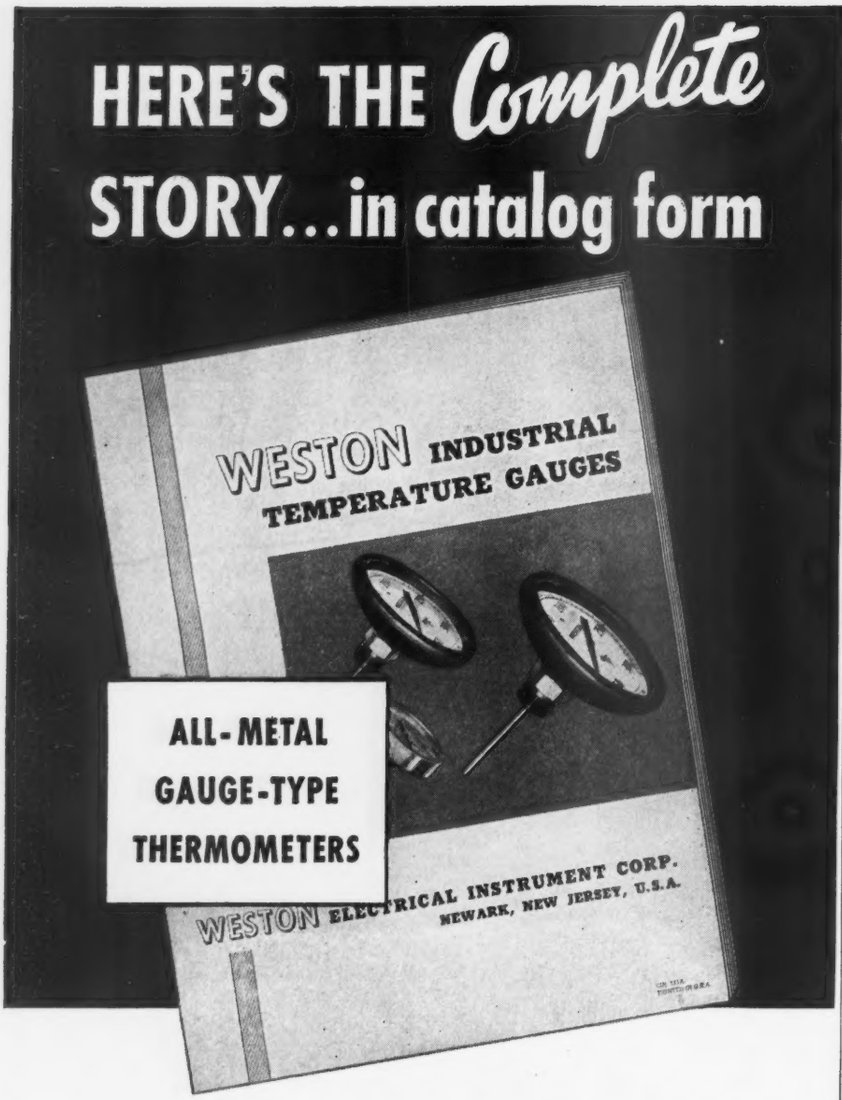

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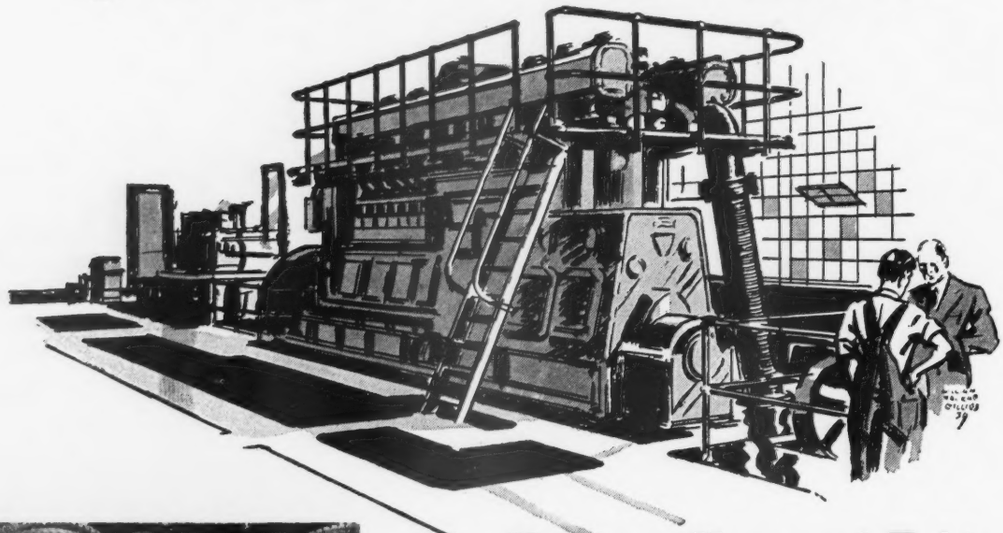

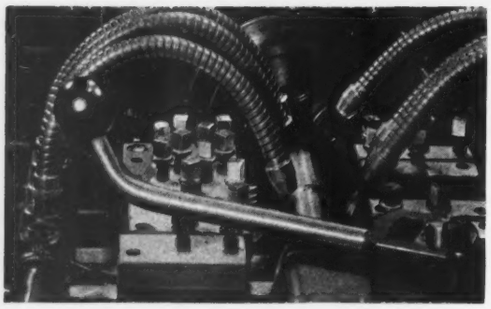

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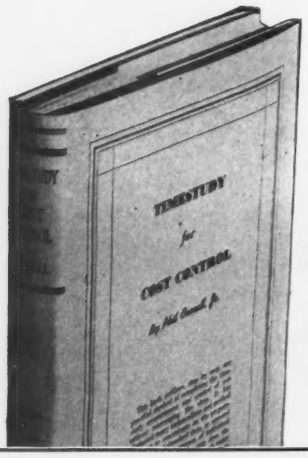

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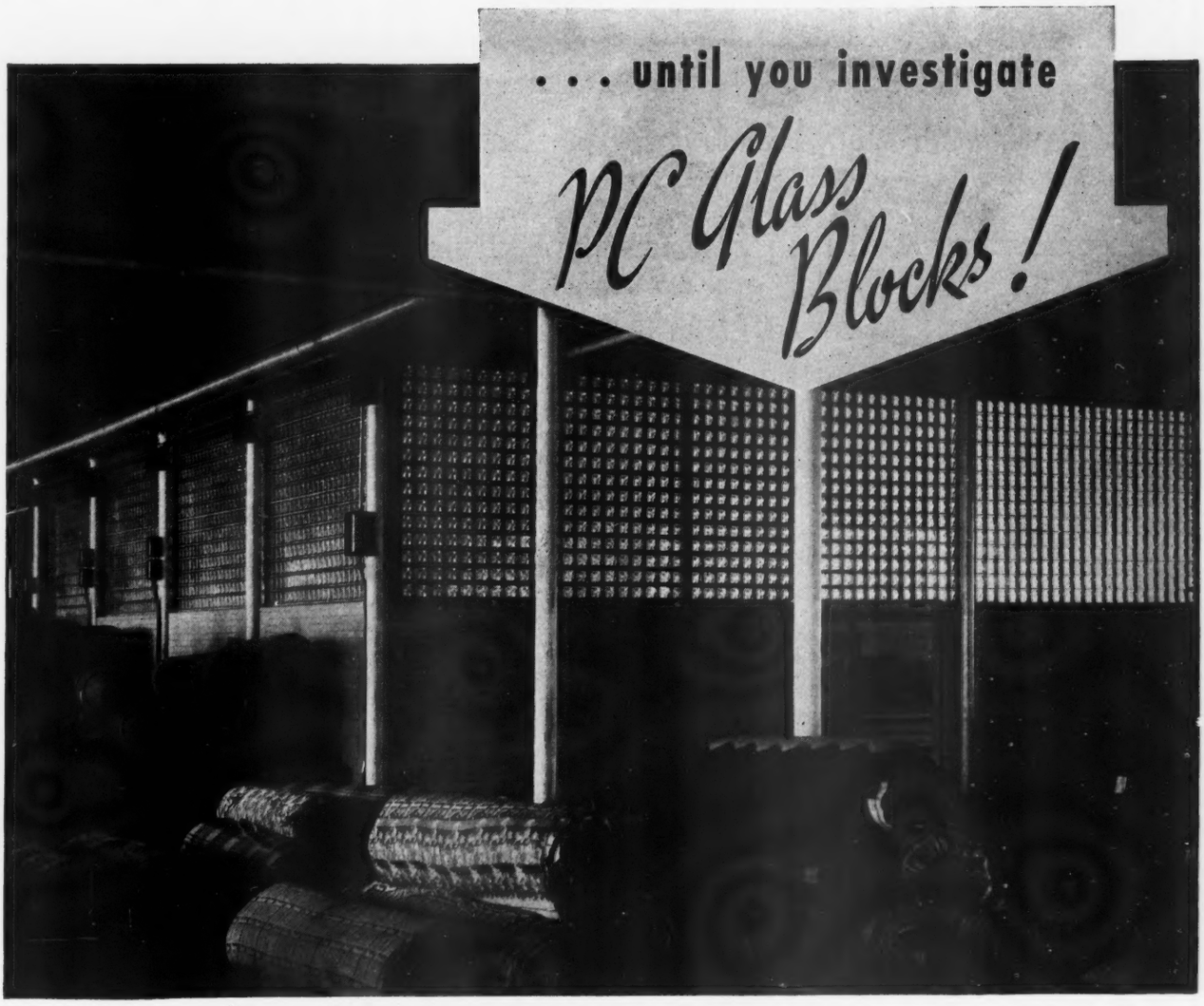

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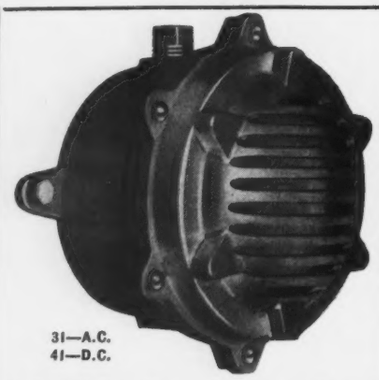

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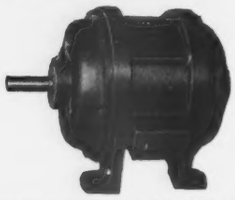

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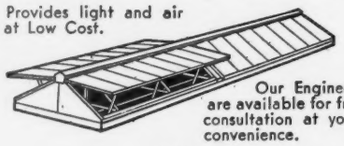

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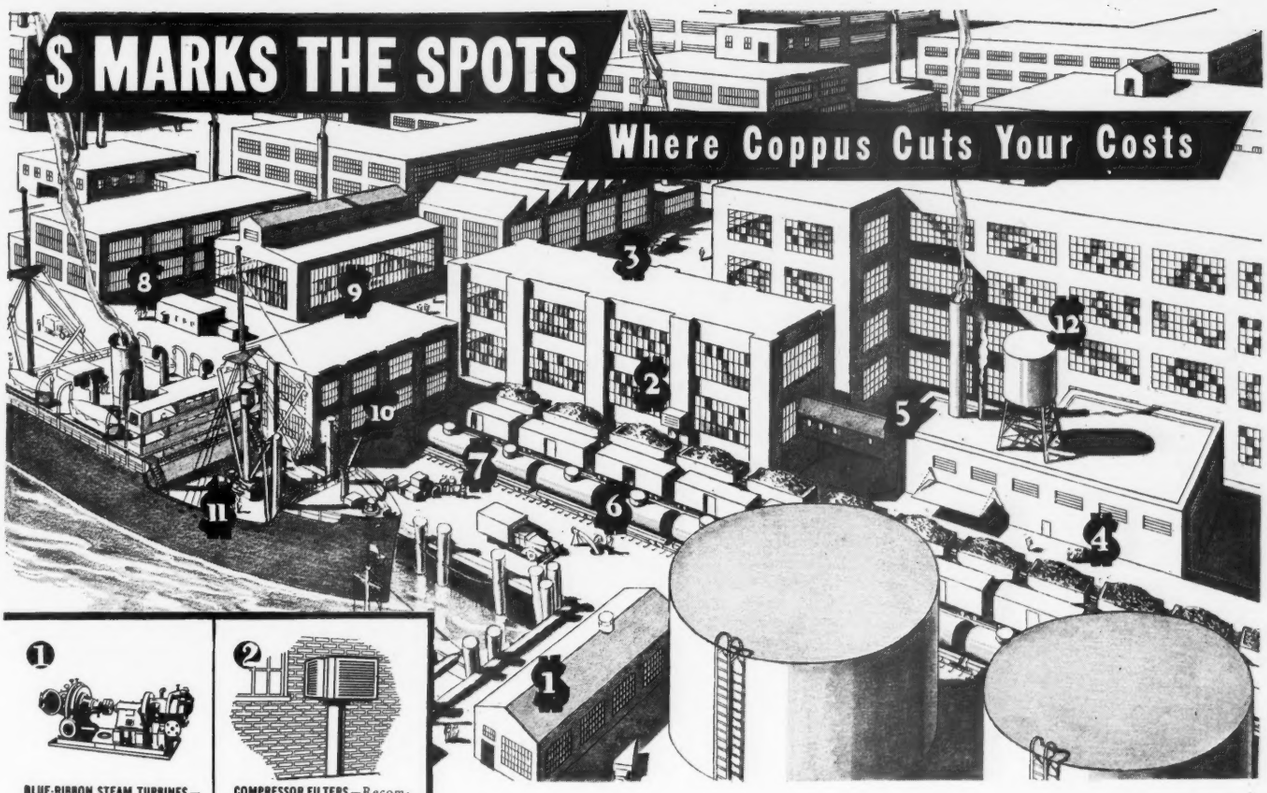

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Houston, Texas
April 24-29, 1939
Booth 1146-1148

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375 Park Avenue, Worcester, Massachusetts

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For all types of die grinding and other tool room jobs there's a complete line of Norton Mounted Points and Mounted Wheels—from the smallest to the largest in a wide variety of shapes. The cutting material is Alundum abrasive and the spindles are stainless steel.

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Exceptional ability to hold its shape and require few dressings—that's one of the outstanding features of the patented Norton "B-E" bond wheel. Combined with long life and fast cutting action it is making this wheel the favorite of tool room men everywhere. And both the few dressings required and long life of this wheel are a result of the extra strength that comes from a welding action in the kiln between abrasive and bond.

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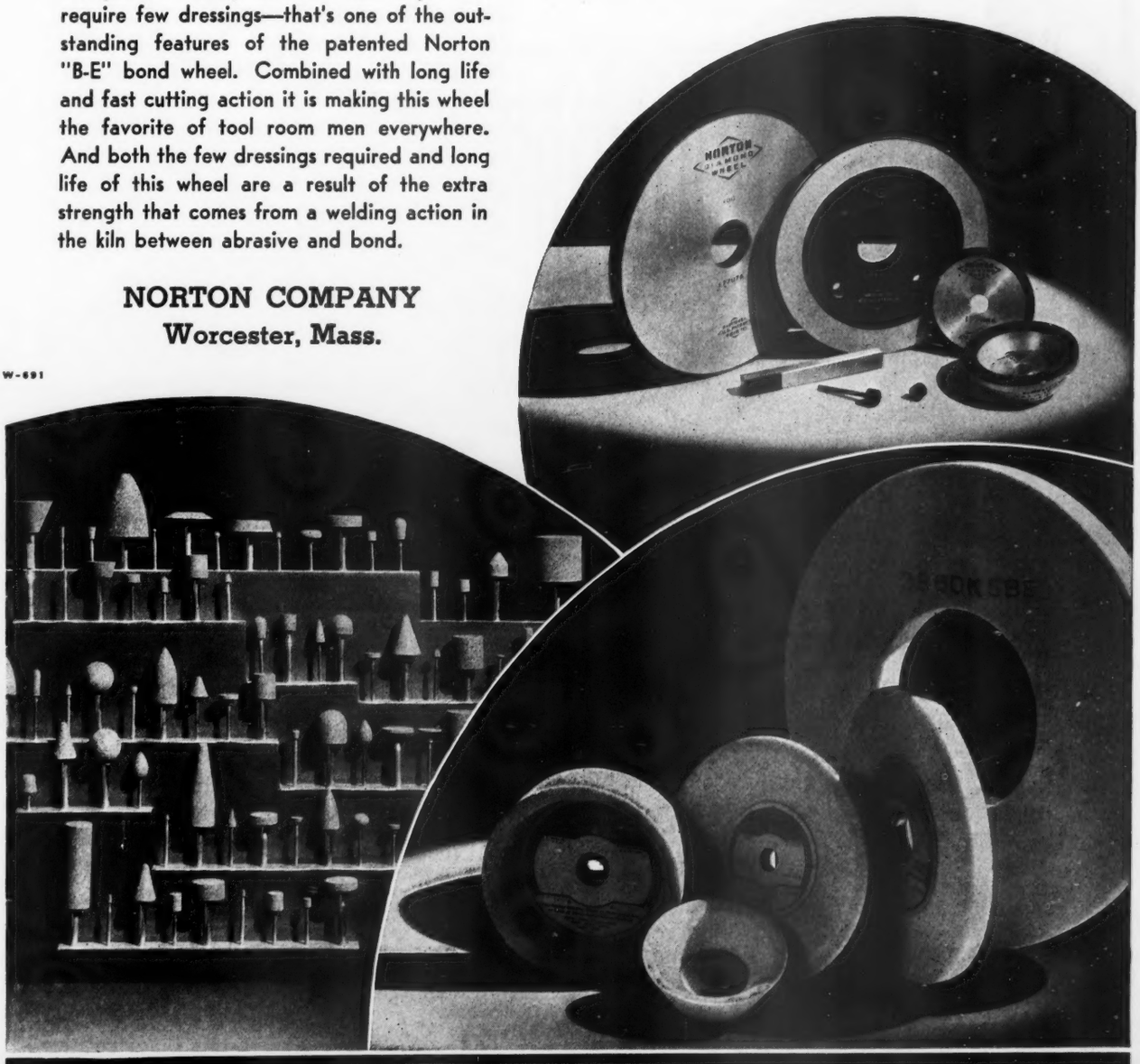
For grinding the cemented carbides there are two outstanding Norton Diamond Wheels—the Resalloy wheel and the new Metal Bonded Wheel—each with distinctive features. Together they make it possible to meet the individual requirements of any job.

NORTON COMPANY
Worcester, Mass.

W-691



NORTON ABRASIVES

HENRY used to throw his pliers at anyone who wistfully whistled "Home Sweet Home" when he was working almost every night rewiring faulty circuits. Now he swings it on the way to supper and enjoys evenings at home, because the "Ten Tested Rockbestos Values" solved his overtime problem.

You may not operate a night shift on electrical maintenance, but don't forget that any single production delay caused by wire-failure may carry a loss that far exceeds the entire cost of proper wiring. Rockbestos users testified to this when they endorsed the ten tested values with these remarks: "No periodic replacement just when attention is needed elsewhere—" "Lowers our production costs by preventing shutdowns." "Rockbestos . . . the answer to a maintenance man's prayer." These unsolicited statements and many others were received from men who are convinced that Rockbestos saves money in reducing maintenance expense and keeping up production schedules . . . perhaps it can do the same for you.

TEN TESTED ROCKBESTOS VALUES

1. Heatproof
2. Fireproof
3. Permanent
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5. Resists heat and vibration
6. Saves work
7. Oil and Greaseproof
8. High overload capacity
9. Permanently flexible
10. Greater carrying capacity

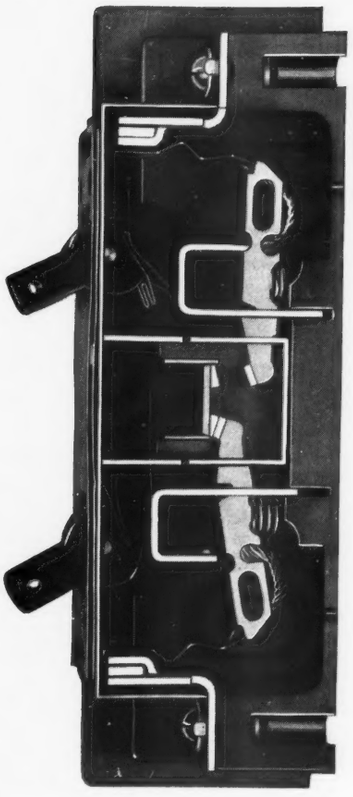
Take an inventory of your money-wasting circuits, check the trouble-causes against the "Ten Tested Rockbestos Values" and let our engineers help you with your problem. For information, samples or a catalog, write to Rockbestos Products Corporation, 914 Nicoll Street, New Haven, Connecticut.

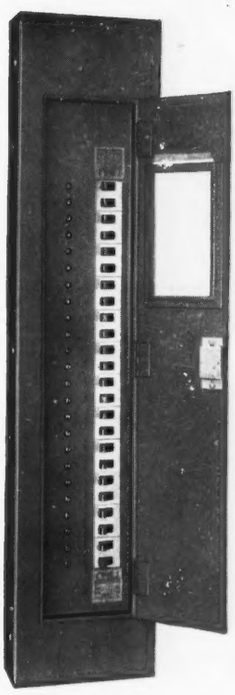
Also refer to Electrical World Buyer's Reference

ROCKBESTOS A.V.C.—*the wire with permanent insulation*

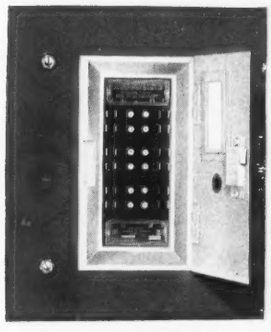
MULTI-BREAKER LIGHTING PANELS

for Low Cost Circuit Breaker Protection

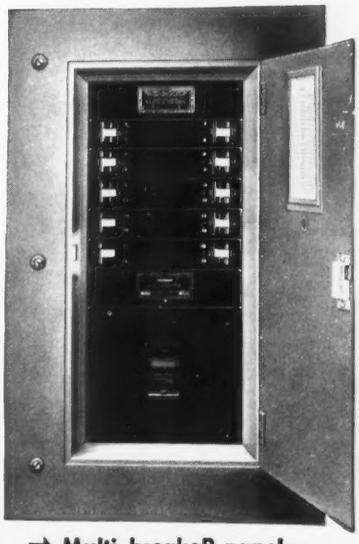




➡ Narrow column Multi-breakeR panelboard.



➡ Multi-breakeR lighting panel.



➡ Multi-breakeR panelboard with main circuit breaker.

➡ **These circuit breaker lighting panels are built from Multi-breakeR units as shown in the center cut-out illustration. The simplicity of the design is the keynote to low cost, long life and trouble-free operation. There are only *three moving parts,* the springs operate under compression, and there are *no bolted or riveted joints* between terminals. By actual test, the operating life of the Square D Multi-breakeR is *many times longer* than ever before attained by a circuit breaker used for similar applications.**

Square D panels are available in standard or narrow column design, 15 to 50 ampere circuits alternating current. Write for Bulletin CA543B.

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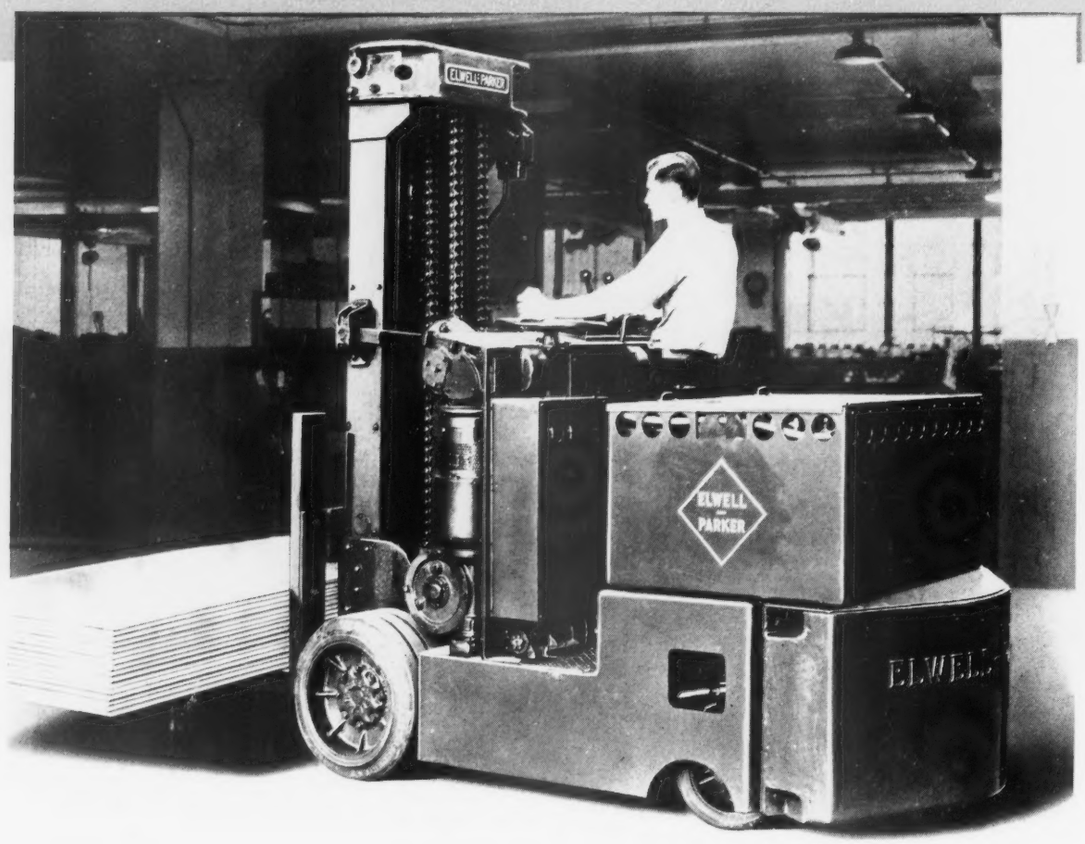
SQUARE D COMPANY

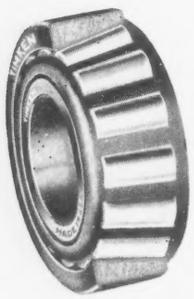
DETROIT - MILWAUKEE - LOS ANGELES

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

Modernize Your Factory Haulage With Timken Bearing Equipped Shop Trucks



Elwell-Parker F-5 "Center Drive" Shop Truck handling a load of steel sheets. Rated capacity, 10,000 pounds. Timken Bearing Equipped.



Shop trucks and trailers equipped with TIMKEN Bearings handle all kinds of materials dependably and economically in and about the factory. Heavier loads can be hauled on single trucks or trains because of the absence of wheel friction. Wheel stability is greatly increased and coincidently, wheel breakage is reduced.

Shop trucks and trailers equipped with TIMKEN Bearing wheels are easier on floors due to smooth running and freedom from wheel wobble. They can be kept in proper operating condition with a minimum of attention for lubrication and maintenance.

If you use this method of handling raw material or finished product it will pay you to replace your obsolete plain bearing trucks with modern TIMKEN Bearing equipment.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

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